IMIC 2016 - Highlights

João V. Vitola

Cardiologist and Nuclear Medicine Physician

QUANTA, Curitiba – Brazil

Consultant IAEA, Austria

Chairman International AP, ASNC, USA
October 10th – 14th, 2016
5 days of lectures and discussion on cardiac imaging
44 speakers from around the world
350 Registrants (~ 100 IAEA support)
92 Participating countries
220 Abstracts/posters
17 organizations/societies/entities cooperating
IMIC 2016 - Cooperation – thank you

Organized by the IAEA

In cooperation with:

- American Society of Nuclear Cardiology (ASNC)
- Arabic Society of Nuclear Medicine (ARSNM)
- Asian Regional Cooperative Council for Nuclear Medicine (ARCCNM)
- Asia Oceania Federation of Nuclear Medicine and Biology (AOFNMB)
- Australian and New Zealand Society of Nuclear Medicine (ANZSNM)
- British Nuclear Medicine Society (BNMS)
- Canadian Association of Nuclear Medicine (CANM)
- European Association of Cardiovascular Imaging (EACVI)
- European Association of Nuclear Medicine (EANM)
- European Society of Radiology (ESR)
- Latin American Association of Societies of Biology and Nuclear Medicine (ALASBIMN)
- Medical University of Vienna (MUV)
- Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD-NEA)

- Society of Cardiovascular Computed Tomography (SCCT)
- Society of Nuclear Medicine and Molecular Imaging (SNMM)
- World Federation of Nuclear Medicine and Biology (WFNMIB)
- World Health Organization (WHO)
Role of UN Agencies in Achieving the Sustainable Development Goals (SDG 3.4)

Oyere K. Onuma, MD MSc
Medical Officer, Cardiovascular Diseases
Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention
WHO HQ, Geneva
NCDs are the leading cause of death globally

Probability of dying between 30 and 70 years from CVD Cancer Diabetes NCDs, %, 2012
Percentage of deaths due to CVD is increasing in LMICs and decreasing in HICs

Roth et al, Circulation 2015
What the Cardiologist needs to know from Medical Images

Gerald Maurer

Department of Cardiology
Medical University of Vienna
Concerns and Pitfalls

- Sensitive technologies may detect subclinical disease that should be left alone
- Overinterpretation
- Detection of non-target findings that may not have clinical relevance but require additional testing
- Risk from invasive or semi-invasive procedures
- Radiation exposure
- Contrast agents – adverse effects
- Cost
Imaging in Ischemic Heart Disease: Role of Cardiac MRI

Chiara Bucciarelli-Ducci MD, PhD, FESC, FRCP
Consultant Senior Lecturer Cardiologist
Bristol Heart Institute, University of Bristol, UK

Chair-elect, Cardiac MRI
European Association Cardiovascular Imaging (EACVI)
European Society of Cardiology (ESC)
Cardiovascular MR

Function → Inducible ischaemia → Infarct size

Microvascular obstruction → Inducible ischaemia → Myocardial oedema
Contrast Enhancement

NSTEMI

HCM

STEMI

MYOCARDITIS

DCM

AMYLOID
Imaging ischemic heart disease: role of SPECT and PET.
Focus on Patients with Known CAD

Hein J. Verberne

Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands

International Conference on Integrated Medical Imaging in Cardiovascular Diseases (IMIC 2016)
Data
<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Assessment With Prior Test Results and/or Known Chronic Stable CAD Prior Noninvasive Evaluation</td>
<td>• Equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern</td>
<td>A (8)</td>
</tr>
<tr>
<td>Risk Assessment With Prior Test Results and/or Known Chronic Stable CAD New or Worsening Symptoms</td>
<td>• Abnormal coronary angiography OR abnormal prior stress imaging study</td>
<td>A (9)</td>
</tr>
<tr>
<td>Risk Assessment With Prior Test Results and/or Known Chronic Stable CAD Coronary Angiography (Invasive or Noninvasive)</td>
<td>• Coronary stenosis or anatomic abnormality of uncertain significance • Evaluation of ischaemic equivalent</td>
<td>A (9)</td>
</tr>
</tbody>
</table>

ACCF etc. JACC 2009;53:2201-29
## Appropriate use criteria

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Assessment:</strong> Postrevascularization (PCI or CABG) †Symptomatic</td>
<td>• Evaluation of ischaemic equivalent</td>
<td>A (8)</td>
</tr>
<tr>
<td><strong>Risk Assessment:</strong> Postrevascularization (PCI or CABG) †Asymptomatic</td>
<td>• Incomplete revascularization</td>
<td>A (7)</td>
</tr>
<tr>
<td></td>
<td>• Additional revascularization feasible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Greater than or equal to 5 years after CABG</td>
<td></td>
</tr>
</tbody>
</table>
## Appropriate use criteria

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
</table>
| **Risk Assessment: Within 3 Months of an ACS STEMI** | • Hemodynamically stable, no recurrent chest pain symptoms or no signs of HF  
  • To evaluate for inducible ischaemia  
  • No prior coronary angiography          | A (8) |
| **Risk Assessment: Within 3 Months of an ACS UA/NSTEMI** | • Hemodynamically stable, no recurrent chest pain symptoms or no signs of HF  
  • To evaluate for inducible ischaemia  
  • No prior coronary angiography          | A (9) |

*ACCF etc. JACC 2009;53:2201-29*
### Appropriate use criteria

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
</table>
| Assessment of Viability/Ischemia Ischemic Cardiomyopathy / Assessment of Viability | - Known severe LV dysfunction  
- Patient eligible for revascularization | A (9) |

ACCF etc. JACC 2009;53:2201-29
Imaging ischemic heart disease:
Role of CCTA

Florian Wolf

Medical University of Vienna
Department of Biomedical Imaging and Image Guided Therapy
Division of Cardiovascular and Interventional Radiology

florian.wolf@meduniwien.ac.at
www.florianwolf.at
www.vienna-heart.at
Conclusions

✓ Cardiac CT angiography – standard method with low radiation dose
✓ Exclusion of CAD works excellent with almost 100% NPV
✓ Detection of CAD also works excellent – but PPV limited

✓ CT-perfusion adds functional information → stenosis relevant?

✓ Triple Rule Out
  ✓ technically possible with relatively low radiation dose
  ✓ But: not often necessary
Imaging Ischemic Heart Disease Role of Echocardiography

Danilo Neglia
FTGM, Pisa, Italy

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
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

ICA (with FFR when necessary)

Coronary CTA in suitable patient* if not done before*

Determine patient characteristics and preferences*

Unclear

Ischaemia

No ischaemia

No stenosis

Stenosis

Unclear

Consider functional CAD
Investigate other causes

Diagnosis SCAD established further risk stratification (see Fig. 3)

Unclear

Ischaemia testing using stress imaging if not done before*

www.escardio.org/EACVI
The "Ischemic" Cascade
Echocardiography

Taquety VR and Di Carli MF
Progress in CV Diseases, 2015
OPEN ISSUES in STABLE IHD
ECHO and Non-Invasive Imaging

- Comparative **DIAGNOSTIC** performance
- Comparative impact on **OUTCOME**
- Comparative **COST-EFFECTIVENESS**
Exercise testing and the ECG

Dr. NATHAN BETTER
Clinical Associate Professor of Medicine
Departments of Cardiology & Nuclear Medicine
Royal Melbourne Hospital
October 2016
I’ve shown you my lab, but now see the Stress ECGs at Joao’s lab ….
The Action Potential and the ECG

Surface recording
Multiple cells
summatd
Action Potential
moving through the
heart

Single Ventricular
Cell Action Potential

P: Atrium
PR: AV Node
QRS: Ventricular
Depolarisation
QT: Action Potential Duration
T&U: Ventricular
Repolarisation

www.textbookofcardiology.org
2nd degree AV Block: Some beats not conducted
Wenckebach Block = Mobitz 1 Block
= Prolonging PR interval until "dropped" (non-conducted) beat
Block at level of AV Node
Implications for stress testing ??
Evidence Based Medicine in Cardiac Imaging

Paolo Raggi, MD

No conflicts to disclose
Definition of EB Practice

Evidence-based practice is “a process of care that takes the patient and his or her preferences and actions, the clinical setting including the resources available, and current and applicable scientific evidence, and knits the three together using the clinical expertise and training of the health-care providers.” (Haynes et al., 2002)
The Nature of Obstacles

- **KNOWLEDGE**
  The base of knowledge enormous and overwhelms professionals often leading to confusion

- **ATTITUDE**
  Recommendations generated by professional organization may be incomplete or conflicting creating resistance to implementation. Furthermore, physicians may feel that the guidelines do not reflect real practice

- **BEHAVIOUR**
  Even when physicians have accepted the evidence there are obstacle to implementing a new EB approach (reimbursement, non availability of imaging tools, pt’s preference etc.)
1. Don’t perform stress cardiac imaging or advanced non-invasive imaging in the initial evaluation of patients without cardiac symptoms unless high-risk markers are present.

Asymptomatic, low-risk patients account for up to 45 percent of unnecessary “screening.” Testing should be performed only when the following findings are present: diabetes in patients older than 40 years-old; peripheral arterial disease; or greater than 2 percent yearly risk for coronary heart disease events.

2. Don’t perform annual stress cardiac imaging or advanced non-invasive imaging as part of routine follow-up in asymptomatic patients.

Performing stress cardiac imaging or advanced non-invasive imaging in patients without symptoms on a serial or scheduled pattern (e.g., every one to two years or at a heart procedure anniversary) rarely results in any meaningful change in patient management. This practice may, in fact, lead to unnecessary invasive procedures and excess radiation exposure without any proven impact on patients’ outcomes. An exception to this rule would be for patients more than five years after a bypass operation.

3. Don’t perform stress cardiac imaging or advanced non-invasive imaging as a pre-operative assessment in patients scheduled to undergo low-risk non-cardiac surgery.

Non-invasive testing is not useful for patients undergoing low-risk non-cardiac surgery (e.g., cataract removal). These types of tests do not change the patient’s clinical management or outcomes and will result in increased costs.

4. Don’t perform echocardiography as routine follow-up for mild, asymptomatic native valve disease in adult patients with no change in signs or symptoms.

Patients with native valve disease usually have years without symptoms before the onset of deterioration. An echocardiogram is not recommended yearly unless there is a change in clinical status.

5. Don’t perform stenting of non-culprit lesions during percutaneous coronary intervention (PCI) for uncomplicated hemodynamically stable ST-segment elevation myocardial infarction (STEMI).

Stenting a non-infarct artery during primary PCI for STEMI in a hemodynamically stable patient may lead to increased mortality and complications. While potentially beneficial in patients with hemodynamic compromise, intervention beyond the culprit lesion during primary PCI has not demonstrated benefit in clinical trials to date.
Closing Considerations

• Despite the obstacles there is optimism for the future of imaging
• Barriers between modalities have been replaced by interest in collaboration
• Universal aspiration at excellence rather than status quo
• Unanimous call for “more evidence” to support imaging
INCAPS – implications for Nuclear Cardiology
IAEA Nuclear Cardiology Protocol Study

João V. Vitola

Cardiologist and Nuclear Medicine Physician
QUANTA, Curitiba – Brazil
Consultant IAEA, Austria
Chairman International AP, ASNC, USA
INCAPS
IAEA Nuclear Cardiology Protocol Study

risk of testing vs risk of not testing

Harmful ?  Useful ?

Justification
Optimization
ALARA
The growing problem of CVD mortality in developing countries
80% of the deaths due to CVD

risk of testing vs risk of not testing

Figure 4
Percentage of deaths due to CVD is increasing in LMICs and decreasing in HICs

Roth et al, Circulation 2015
Underutilized or non-existent in Many Nations ~ where mortality is high!
### BEST PRACTICE ADHERENCE BY REGION
NUMBER (%) OF LABS ADHERING TO EACH PRACTICE

<table>
<thead>
<tr>
<th>Practice</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>Latin America</th>
<th>North America</th>
<th>Oceania</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid thallium stress</td>
<td>12(100%)</td>
<td>52(75%)</td>
<td>97(95%)</td>
<td>35(97%)</td>
<td>55(100%)</td>
<td>31(91%)</td>
<td>282(92%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoid dual isotope</td>
<td>12(100%)</td>
<td>64(93%)</td>
<td>101(99%)</td>
<td>34(94%)</td>
<td>53(96%)</td>
<td>34(100%)</td>
<td>298(97%)</td>
<td>0.2</td>
</tr>
<tr>
<td>Avoid too much Tc</td>
<td>11(92%)</td>
<td>64(93%)</td>
<td>101(99%)</td>
<td>23(64%)</td>
<td>33(60%)</td>
<td>31(91%)</td>
<td>263(85%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoid too much Tl</td>
<td>12(100%)</td>
<td>68(99%)</td>
<td>102(100)</td>
<td>35(97%)</td>
<td>55(100%)</td>
<td>34(100%)</td>
<td>306(99%)</td>
<td>0.48</td>
</tr>
<tr>
<td>Perform stress-only</td>
<td>8(67%)</td>
<td>16(23%)</td>
<td>47(46%)</td>
<td>7(19%)</td>
<td>9(16%)</td>
<td>6(18%)</td>
<td>93(30%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use camera based dose reduction strategies</td>
<td>8(67%)</td>
<td>48(70%)</td>
<td>71(70%)</td>
<td>16(44%)</td>
<td>33(60%)</td>
<td>30(88%)</td>
<td>206(67%)</td>
<td>0.005</td>
</tr>
<tr>
<td>Weight based dosing for Technetium</td>
<td>6(50%)</td>
<td>8(12%)</td>
<td>48(47%)</td>
<td>11(31%)</td>
<td>10(18%)</td>
<td>5(15%)</td>
<td>88(29%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoid “shine through”</td>
<td>7(58%)</td>
<td>26(38%)</td>
<td>66(65%)</td>
<td>14(39%)</td>
<td>8(15%)</td>
<td>15(44%)</td>
<td>136(44%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Stable Ischemic Heart Disease in the Female Patient

Leslee J. Shaw, PhD, MASNC, FACC, FAHA, FSCCT
President, Society of CV Computed Tomography
Past-President, American Society of Nuclear Cardiology
Professor of Medicine
Co-Director, Emory Clinical CV Research Institute
Emory University School of Medicine
Atlanta, Georgia

Disclosures: Dean's Distinguished Faculty Award – Emory University; Albert E. Levy Scientific Research Award; Woodruff Foundation; Antinori Foundation: NIH-NHLBI (R01HL118049-02, R01HL11150,1U01HL10556-01).
Sex Paradox in Chest Pain

Angiographic Findings
  Less Obstructive CAD
  Preserved Systolic Function / Yet more HF

Clinical Comorbidity
  Older, More Diabetes, HTN...Risk Factor Clustering
  More Anginal-Equivalent / Atypical Symptoms (e.g., Dyspnea)
  Higher Brain Natriuretic Peptide, C Reactive Protein

Clinical Outcomes
  Worsening CVD Outcomes


Viviany R. Taqueti, MD, MPH; Sharmila Dorbala, MD, MPH; David Wolinsky, MD; Brian Abbott, MD; Gary V. Heller, MD, PhD; Timothy Bateman, MD; Jennifer H. Mieres, MD; Lawrence M. Phillips, MD; Nanette K. Wenger, MD; Leslee J. Shaw, PhD
Prognostic Accuracy of SPECT MPI in Women

Risk-Adjusted Mortality Across Diverse Racial & Ethnic Subsets of Women Undergoing SPECT MPI

Risk-Adjusted Cumulative Incidence of All-Cause Mortality

N=2,225 women referred for SPECT-MPI followed by a mean period of 3.7 ± 1.4 years

Source: Circ J Am Coll Cardiol Img 2011;4:880-888.
American College of Cardiology –
CVD in Women Committee Statement

Patient with symptoms and/or signs of ischemic heart disease (IHD)

Does patient have obstructive coronary artery disease (CAD) or nonobstructive CAD?

**OBSTRUCTIVE CAD**
- Prevalence: Men > Women
- Predominantly men (and older women)
- Reduced left ventricular (LV) systolic function

**NONOBSTRUCTIVE CAD**
- Prevalence: Women > Men
- Predominantly younger, middle-aged women
- Preserved LV systolic function
- Possible plaque erosion with subsequent thrombus formation
- Often multiple mechanisms for ischemia
- Associated with heightened risk for adverse outcomes

**IHD diagnosis**

**Guideline-specific diagnostic, preventive, and/or treatment strategies**

Unfortunately, IHD diagnosis is often deferred and delayed

**No guideline recommended assessment or management is available**
(except for symptom relief and CVD risk factor management)

Nonobstructive CAD requires better recognition and investigation

Need to develop effective prevention, diagnosis, and treatment approaches

Diagnosis of Obstructive CAD in Women

Mild-Modest Correlation Between Functional & Anatomic Tests

Myocardial Ischemia ≠ Anatomic Stenosis
NIH Women’s Ischemia Syndrome Evaluation: Chest Pain + No Obstructive CAD

N = 100 Women with No Stenosis

79% Prevalence of Atherosclerotic Plaque

Source: Khuddus J Interven Cardiol 2010;23:511-519.
Coronary Macro- and Micro-circulation

Current status of CT coronary angiography

Dr Michelle Williams
Clinical Lecturer in Cardiothoracic Radiology
University of Edinburgh, Scotland, UK
Michelle.Williams@ed.ac.uk
Learning outcomes

• 1. Knowledge of current research into the application of CT coronary angiography for patients with suspected coronary artery disease including stable chest pain and in the emergency department

• 2. Understand the advantages and limitations of CT coronary angiography in the diagnosis of suspected coronary artery disease
Comprehensive cardiac CT

1. Patient preparation
2. CTCA & Rest images
3. Adenosine infusion
4. Stress perfusion & function
5. Delayed enhancement
6. Home

- Structure
- Function
- Perfusion
- Viability

Williams MC, Heart 2011
# Meta-analysis – stable chest pain

<table>
<thead>
<tr>
<th>Study</th>
<th>Inclusion</th>
<th>Exclusion</th>
<th>Total N</th>
<th>CTCA</th>
<th>Standard care</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROMISE</td>
<td>Symptomatic, non-urgent noninvasive CV testing necessary for suspected CAD indicated, age &gt;54 y in men and &gt;64 y in women or between 45 and 54 y plus ≥1 risk factors in men and between 55 and 64 y plus ≥1 risk factors in women</td>
<td>Previous CAD, previous evaluation for CAD in the last 12 month or other cardiac abnormality or contraindication to any test in any arm</td>
<td>10003</td>
<td>4996</td>
<td>507</td>
</tr>
<tr>
<td>SCOT-HEART</td>
<td>Symptomatic stable chest pain evaluation, age between 18 and 75 y for both sexes</td>
<td>Contraindication to coronary CTA</td>
<td>4146</td>
<td>2073</td>
<td>2073</td>
</tr>
<tr>
<td>CAPP</td>
<td>Symptomatic stable chest pain evaluation, no age range</td>
<td>Contraindication to coronary CTA or treadmill test</td>
<td>488</td>
<td>243</td>
<td>245</td>
</tr>
<tr>
<td>Min et al</td>
<td>Symptomatic stable chest pain evaluation, non urgent noninvasive CV testing necessary for suspected CAD indicated, age ≥ 40 y for both sexes</td>
<td>Previous CAD, contraindication to either arm or a class I indication for invasive angiography</td>
<td>180</td>
<td>91</td>
<td>89</td>
</tr>
</tbody>
</table>

**Table:**

|          | 14817 | 7403 | 7414 |
Role of multidetector computed tomography in the diagnosis and management of patients attending the rapid access chest pain clinic, The Scottish computed tomography of the heart (SCOT-HEART) trial: study protocol for randomized controlled trial
Twelve centers across Scotland

Recruited 4146 patients:
2073 Standard care
2073 + CTCA
CHD Death and Non-fatal MI

*Post-hoc Landmark Analysis*

<table>
<thead>
<tr>
<th>Implementation Delay</th>
<th>Impact of Alterations in Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTCA</td>
<td>Standard Care</td>
</tr>
<tr>
<td></td>
<td>- CTCA Performed</td>
</tr>
<tr>
<td></td>
<td>- Result Reviewed</td>
</tr>
<tr>
<td></td>
<td>- Management Changed</td>
</tr>
<tr>
<td></td>
<td>- Invasive Angiography Arranged</td>
</tr>
</tbody>
</table>

Proportion of patients with an event (%)

- CTCA Performed
- Result Reviewed
- Management Changed
- Invasive Angiography Arranged

HR 0.50 [0.28-0.88]  
P = 0.015

Williams et al, JACC, 2016
The CONSERVE Trial

COronary Computed Tomographic ANgiography for SElective Cardiac Catheterization Relation to CardioVascular Outcomes and Economics


Randomised multicentre controlled trial
1530 patients with indications for invasive coronary angiography
Direct invasive coronary angiography vs selective CT driven

No difference in MACE at 12 months
Lower rates of invasive coronary angiography
Lower costs ($2,883 vs $6,031).

http://congress365.escardio.org
Imaging Congestive Heart Failure: Role of SPECT and PET
Recovery Prediction after Revascularisation

Anavekar NS et al., JACC 2016
Klinische Abteilung für Nuklearmedizin
Univ.-Prof. Dr. med. M. Hacker
Resynchronization Therapy - Response Evaluation

$^{18}$F-FDG PET/IdCT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>All patients (n = 14)</th>
<th>Responders (n = 7)</th>
<th>Nonresponders (n = 7)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>67.9 ± 8.4</td>
<td>68.0 ± 8.8</td>
<td>67.7 ± 8.7</td>
<td>NS</td>
</tr>
<tr>
<td>Men</td>
<td>12 (86)</td>
<td>6 (86)</td>
<td>6 (86)</td>
<td>NS</td>
</tr>
<tr>
<td>Angiotensin-converting enzyme inhibitor</td>
<td>13 (93)</td>
<td>7 (100)</td>
<td>6 (86)</td>
<td>NS</td>
</tr>
<tr>
<td>β-blocker</td>
<td>13 (93)</td>
<td>6 (86)</td>
<td>7 (100)</td>
<td>NS</td>
</tr>
<tr>
<td>Diuretics</td>
<td>10 (71)</td>
<td>4 (57)</td>
<td>6 (86)</td>
<td>NS</td>
</tr>
<tr>
<td>Aldosterone receptor antagonist</td>
<td>8 (57)</td>
<td>4 (50)</td>
<td>4 (50)</td>
<td>NS</td>
</tr>
<tr>
<td>Clinical evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYHA class before CRT</td>
<td>3.0 ± 0.0</td>
<td>3.0 ± 0.0</td>
<td>3.0 ± 0.0</td>
<td>NS</td>
</tr>
<tr>
<td>NYHA class after CRT</td>
<td>2.6 ± 0.6</td>
<td>2.0 ± 0.0</td>
<td>3.1 ± 0.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Δ NYHA class*</td>
<td>-0.4 ± 0.6</td>
<td>-1.0 ± 0.3</td>
<td>+0.1 ± 0.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Brain natriuretic peptide before CRT (pg/mL)</td>
<td>625 ± 514</td>
<td>691 ± 562</td>
<td>560 ± 473</td>
<td>NS</td>
</tr>
<tr>
<td>Brain natriuretic peptide after CRT (pg/mL)</td>
<td>432 ± 533</td>
<td>236 ± 257</td>
<td>628 ± 679</td>
<td>NS</td>
</tr>
<tr>
<td>Δ Brain natriuretic peptide (pg/mL)</td>
<td>-193 ± 467</td>
<td>-454 ± 416</td>
<td>+68 ± 373</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Echocardiographic parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVEF before CRT (%)</td>
<td>25 ± 8</td>
<td>24 ± 9</td>
<td>27 ± 8</td>
<td>NS</td>
</tr>
<tr>
<td>LVEF after CRT (%)</td>
<td>32 ± 13</td>
<td>39 ± 14</td>
<td>26 ± 8</td>
<td>NS</td>
</tr>
<tr>
<td>Δ LVEF (%)</td>
<td>+7 ± 12</td>
<td>+15 ± 11</td>
<td>-1 ± 7</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>LVEF before CRT (mL)</td>
<td>219 ± 57</td>
<td>231 ± 64</td>
<td>206 ± 52</td>
<td>NS</td>
</tr>
<tr>
<td>LVEF after therapy (mL)</td>
<td>177 ± 65</td>
<td>150 ± 51</td>
<td>205 ± 70</td>
<td>0.073</td>
</tr>
<tr>
<td>Δ LVEF (mL)*</td>
<td>-41 ± 51</td>
<td>-82 ± 37</td>
<td>+1 ± 24</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Residual dyssynchrony</td>
<td>7 (50)</td>
<td>2 (29)</td>
<td>5 (71)</td>
<td></td>
</tr>
<tr>
<td>PET/IdCT, including salvage analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scar burden (%)</td>
<td>20 ± 19</td>
<td>10 ± 8</td>
<td>30 ± 21</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Lead over scar</td>
<td>4 (29)</td>
<td>0 (0)</td>
<td>4 (57)</td>
<td></td>
</tr>
<tr>
<td>Bandwidth (°)</td>
<td>90 ± 38</td>
<td>91 ± 28</td>
<td>89 ± 48</td>
<td>NS</td>
</tr>
<tr>
<td>Phase SD (°)</td>
<td>38 ± 11</td>
<td>42 ± 8</td>
<td>34 ± 14</td>
<td>NS</td>
</tr>
<tr>
<td>Phase entropy (°)</td>
<td>80 ± 5</td>
<td>77 ± 4</td>
<td>83 ± 3</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Imaging congestive heart failure: role of coronary computed tomography angiography (CCTA)

Gianluca Pontone, MD, PhD, FESC, FSCCT
Director of MR Unit
Deputy Director of Cardiovascul CT Unit
Clinical Cardiology Unit
Centro Cardiologico Monzino, IRCCS
University of Milan, Italy
SUMMARY

- Volume, function and remodelling
- Rule out coronary artery disease
- To evaluate LV myocardial damage
- To evaluate cardiac veins anatomy
Cardiac MRI in Heart Failure

Chiara Bucciarelli-Ducci MD, PhD, FESC, FRCP

Chair-elect, Cardiac MRI
European Association of Cardiovascular Imaging (EACVI)
European Society of Cardiology

Bristol Heart Institute, University of Bristol

Royal Brompton Hospital & National Heart Lung Institute
Imperial College, London
Contrast Enhancement

- NSTEMI
- HCM
- STEMI
- MYOCARDITIS
- DCM
- AMYLOID
Imaging in heart failure: role of echocardiography

Bogdan A. Popescu FESC, FACC

University of Medicine and Pharmacy “Carol Davila”
Euroecolab, Institute of Cardiovascular Diseases
Bucharest, Romania

IMIC 2016
Vienna, Oct 11, 2016
Echo in heart failure – clinical use

- Diagnosis
- Prognosis
- Therapy

Class I recommendation, LoE C

ESC Guidelines on HF. Eur Heart J 2016.
A critical feature of echocardiography…

Bedside technique…

- Can be performed everywhere
- Ideally suited for acute/severe pts
INTERVENTIONAL CARDIOLOGY AND NON-INVASIVE IMAGING
GETTING TO KNOW ONE ANOTHER

G KARTHIKEYAN, MD, DM, MSC
PROFESSOR OF CARDIOLOGY
ALL INDIA INSTITUTE OF MEDICAL SCIENCES
NEW DELHI, INDIA

PHRI INTERNATIONAL FELLOW
MCMASTER UNIVERSITY, CANADA
THE MIND OF AN INTERVENTIONIST

IMIC, Vienna Oct 2016
HOW IMAGERS CAN HELP

Establish channels of communication (heart team)

Provide precise and quantitative reports (severity, extent of ischemia or viability)

Education (particularly of trainees)
OECD-NEA and the Supply of Medical Isotopes

IAEA IMIC 2016
October 12, 2016

Kevin Charlton
OECD Nuclear Energy Agency
Analyst - Nuclear Development Division
NRU Contingency Capacity 2016-2021

Current demand (9 000 6-day Ci\textsuperscript{99}Mo/week EOP) and demand +35\% ORC v processing capacity – current and total, with and without NRU CC
What happened since the Report was Published?

• Positive
  • LVR-15 (Czech Republic) increased weekly irradiation capacity by 25% to 3,000 6-day Ci/wk EOP
  • BR-2 Reactor (Belgium) returned to service on time after an extended refurbishment with the capacity for more cycles/year
  • ANSTO (Australia) increased irradiation and processing capacity in existing facility by >100% to 2,200 6-day Ci/wk EOP
  • ANSTO (Australia), confirmed good on-schedule progress with their new facility (total capacity 3,500 6-day Ci/wk EOP)

• Negative
  • Some project delays announced, NorthStar (USA) LINAC production 2018 > 2019, FRM-II (Germany) irradiations 2018 > Mid 2019, JHR (France) irradiations 2021 > +2022
Key Points

• Demand estimate maintained at 9 000 6-day $^{99}$Mo Ci/wk EOP
• There is a need to add processing capacity by 2017 if this is achieved, capacity should be fully secured until at least 2021
  • on-time completion of substantial conventional processing capacity in Australia is important
  • supply will continue to require careful and well considered planning to minimise risks
    • supported by AIPES Reactor and Isotope Workgroup
    • regular monitoring and periodic review will be needed, particularly the progress in bringing new capacity to market
• Supply remains secure
  • however, economic sustainability remains a challenge
OVERVIEW OF SPECT AND PET TRACERS FOR CARDIOLOGY

Adriano Duatti
Department of Chemical and Pharmaceutical Sciences
University of Ferrara
Via L. Borsari, 46, 44121 Ferrara, Italy

dta@unife.it
adriano.duatti@unife.it
The ‘Beauty and Damnation’ of molecular imaging is that we are using sophisticated molecular tools for exploring biological processes, but unfortunately we don’t have yet a complete and exhaustive picture of the underlying cellular biology.

However, for this very same reason there’s plenty of opportunities for both SPECT and PET to keep a relevant position in myocardial imaging.

Beside new promising tracers, there are still numerous tracers left behind in a box because of their low commercial interest, but that could be potentially beneficial for patients.

It is the responsibility of the nuclear physician to make the right choice for the patient that sometime is not available on the market, but can be easily set up in the radiopharmacy.
Nuclear Cardiology in the evaluation of sympathetic innervation

Victor Kalff MBBS FRACP, FACC
WFNMB, ANZSNM
Alfred Hospital Victoria
Australia
Summary:

I-123 MIBG now approved in USA for heart failure.

Simple planar 4hr H/M ratio: strong prognostic factor for survival & arrhythmias but still lacking prospective trials showing MIBG guidance, is beneficial and cost-effective.

Has potential role in optimizing patient management.

With new technology, SPECT may be useful in managing SCD in CHF but ? limited to intermediate H/M risk pts.

To date C-11 based PET tracers only approved for research. New, more suitable F-18 labeled NA analogues on the way
Nuclear Cardiology
How to detect cardio-vascular
prosthetic valves and devices infections
by 18F-FDG-PET ? part I

Prof Denis AGOSTINI, MD PhD
Cardiologist and Nuclear Physician
Instructor at the ESNM
University Hospital Caen-Normandy
France

Vienna IAEA 2016
FDG PET and Infective Endocarditis with streptocoque type A

Infection of leads and Right Atrium Metastatic foci on lungs
Conclusion

- FDG PET in infective endocarditis
- Allows early identification of
- Septic emboli / metastatic infection
- Portal of entry
- Impacts on diagnosis of PVE
- Impacts on patients’ management
- Guidelines: EANM/ESC/EACVI
Nuclear Cardiology
How to determine coronary flow reserve by dynamic CZT camera?
part II

Vienna IAEA 2016
D-SPECT vs PET Coronary Flow Reserve

R = 0.84
IAEA-IMIC 2016: Ethics: Case in Point
Ethics Definition

• values relating to human conduct with respect to rightness and wrongness of actions and goodness and badness of motives and ends of such actions
• concept dealing with ways of making life better contributing to a civilized society built on a platform of our beliefs and values
• represents an aptitude to change ourselves into something better
In Pursuit of Excellence: Leadership: Case in Point

Sobhan Vinjamuri
British Nuclear Medicine Society
October 2016
GOOD LEADER

- focus on team needs and interests
- inspiration
- integrity
- clear goals
- good example
- vision
- clear communication
- expects the best
- support
- encouragement
- recognition
- stimulating work
EDUCATION: Case in Point

Henry Bom, MD, PhD, FANMB

President, Asia Oceania Federation of Nuclear Medicine and Biology
Professor, Chonnam National University, S. Korea
EDUCATION
for
- Sustainability
- Growth
New Challenges in Nuclear Cardiology Practice

Brian G. Abbott, MD, FACC, FASNC, FAHA

President, ASNC 2016

Associate Professor of Medicine
Warren Alpert Medical School of Brown University
Director, Cardiovascular Imaging
Cardiovascular Institute, Rhode Island, Miriam and Newport Hospitals
Providence, Rhode Island, USA
ASNC International Membership

< 400 International Members
62 Countries
New Challenges in Nuclear Cardiology Practice

- Training and education (PET)
- Isotope shortages
- Appropriate use
- Emerging technologies and techniques
- Radiation dose reduction strategies
- International Growth of Nuclear Cardiology
Concerning Pattern: Decreasing Rate of Technetium Use

Murthy, et al. JAMA Cardiology 2016 1:616-7
GUÍAS PARA LOS PROCEDIMIENTOS DE IMAGEN EN CARDIOLOGÍA NUCLEAR DE LA AMERICAN SOCIETY OF NUCLEAR CARDIOLOGY (ASNC)

Tomografía por emisión de fotones únicos (SPECT)

Thomas A. Holly\textsuperscript{a}, MD; Brian G. Abbott\textsuperscript{b}, MD; Mouaz Al-Mallah\textsuperscript{c}, MD; Dennis A. Calnon\textsuperscript{d}, MD; Mylan C. Cohen\textsuperscript{e}, MD, MPH; Frank P. DiFilippo\textsuperscript{f}, PhD; Edward P. Ficaro\textsuperscript{g}, PhD; Michael R. Freeman\textsuperscript{h}, MD; Robert C. Hendel\textsuperscript{i}, MD; Diwakar Jain\textsuperscript{j}, MD; Scott M. Leonard\textsuperscript{a}, MS, CNMT, RT(N); Kenneth J. Nichols\textsuperscript{k}, PhD; Donna M. Polk\textsuperscript{l}, MD, MPH, y Prem Soman\textsuperscript{m}, MD, PhD

Traducción realizada por Fernando Mut, MD, y Néstor Alejandro Vita, MD, y revisada por Jeffrey Rosenblatt, MD, FACC, FASNC, para la ASNC.
核心脏病学程序 ASNC 成像指南

单光子发射计算机断层扫描
Chinese translation reviewed by: 李亚明，李剑明

Thomas A. Holly, MD\textsuperscript{a}, Brian G. Abbott, MD\textsuperscript{b}, Mouaz Al-Mallah, MD\textsuperscript{c}, Dennis A. Cainon, MD\textsuperscript{d}, Mylan C. Cohen, MD, MPH\textsuperscript{e}, Frank P. DiFilippo, PhD\textsuperscript{f}, Edward P. Ficaro, PhD\textsuperscript{g}, Michael R. Freeman, MD\textsuperscript{h}, Robert C. Hendel, MD\textsuperscript{i}, Diwakar Jain, MD\textsuperscript{j}, Scott M. Leonard, MS, CNMT, RT(N)\textsuperscript{k}, Kenneth J. Nichols, PhD\textsuperscript{l}, Donna M. Polk, MD, MPH\textsuperscript{m} 及 Prem Soman, MD, PhD\textsuperscript{n}
FROM A QUESTION TO A PAPER

Dr. Naima K. Al Bulushi, MD, FFR RCSI

HOD, Nuclear medicine department and Molecular Imaging Centre,
Muscat, Oman
Arab Society of Nuclear Medicine (ARSNM)
THE ‘BE’ RULE

 Be Reasonable.
 Be Thoughtful
 Be Yourself & Ask Hard Questions
 Be Self-Motivated and do not wait for Encouragement or Support
 Be Self-Confident with No Need of Self Praise
Peptides, Nanoparticles and other New Cardiac Radiopharmaceuticals

International Atomic Energy Association
IMAC 2016
Vienna, Austria
October 15, 2016

Sally W. Schwarz, MS, BCNP
President SNMMI
Professor of Radiology
Co-Director Cyclotron Facility
Washington University School of Medicine
St. Louis, MO
Areas of Focus

• Atherosclerotic plaque formation and detection
  – Naturetic peptides and receptors
  – Chemokine receptors as markers of inflammatory cell influx
    • Atheroviral macrophage inflammatory Protein-II (vMIP-II) based imaging probe
    • D-Alpha1-peptide T-amide (DAPTA) peptide based tracers for detection of CCR5 receptor expressed on plaque

• Myocardial perfusion imaging (MPI)
  – For determination of reversible ischemia, infarcted tissue
Sr-82 PRODUCTION
WITH HIGH-ENERGY CYCLOTRONS

Adriano Duatti
Department of Chemical and Pharmaceutical Sciences
University of Ferrara
Via L. Borsari, 46, 44121 Ferrara, Italy
dta@unife.it
adriano.duatti@unife.it
$^{85}\text{Rb}(p,4n)^{82}\text{Sr}$
IAEA assistance in RI production and supply: $^{99}$Mo case

Joao Alberto Osso Junior
Head, Radioisotope Products and Radiation Technology Section
NAPC/NA/IAEA
The IAEA Mandate

“The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”
Accelerator-based Alternatives to Non-HEU production of Mo-99/Tc-99m

• 2011-2015

• 18 participants from 16 Member States

Production of Tc-99m in cyclotron - very successful: 6 hours irradiation time, 24 MeV, 450 μA: 34 Ci of Tc-99m

• Clinical trials under way; regulatory approvals sought

• Self-sufficiency in hospitals/towns/country

• Good option for hospital or radiopharmacy; local productions

• Target specifications; reuse of targets etc. need consideration

Comparison of cyclotron- and reactor-based Tc-99m pertechnetate for the Univ. of Alberta Clinical Trial (cancer thyroid patients imaged post-thyroidectomy)
Radiation Burden in Cardiology

A quick tour!

David Sutton
Guiding Principles

- Justification
- Limitation
- Optimisation
Thursday, 13 October 2016; Time: 14:20-14:40
Session: Fundamentals III: Safety and quality

Appropriate use Criteria

Sharmila Dorbala, MD, FACC
Director of Nuclear Cardiology
Associate Professor Radiology

ASNC

SNMMI
SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING
AUC: Take home points

• Do not perform
  • Routine annual testing after coronary artery revascularization
  • Stress cardiac imaging or coronary angiography in patients without cardiac symptoms unless high-risk markers are present
  • Cardiac imaging in patients who are low risk
  • Radionuclide imaging as a part of routine follow-up of asymptomatic patients
  • Preoperative assessment in patients scheduled to undergo low or intermediate risk non cardiac surgery

• Use methods to reduce radiation exposure in cardiac imaging whenever feasible, including not performing the tests when the benefits will likely be limited
Quality management and clinical audits in nuclear medicine
Results from IAEA projects

Maurizio Dondi, MD
NMDI/IAEA
Vienna, IMIC 2016
# Quality Management Audits in Nuclear Medicine

## Checklist Summary

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Conformance Level</th>
<th>Status</th>
<th>Comments/Planned Action</th>
<th>Date Achieved</th>
<th>Example of recall</th>
<th>Type of evidence</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Is the strategy of the nuclear medicine service in accordance with specific objectives developed on the national/regional level?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written documents describing the strategy of the IMS and the objectives at national/regional level.</td>
<td></td>
<td>IAEA-TEC-143, chap.15, par.14.2.3, par.14.2.5, IAEA-TEC-118, chap.3.2.1</td>
</tr>
<tr>
<td>1.2</td>
<td>Is the strategy of the nuclear medicine service in accordance with specific objectives developed by the hospital/management?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written documents describing the IMS and institutional strategy.</td>
<td></td>
<td>IAEA-TEC-143, chap.15, par.14.2.3, par.14.2.5, IAEA-TEC-118, chap.3.2.1</td>
</tr>
<tr>
<td>2.1</td>
<td>Is the contribution of the other services of the institution (diagnosis, oncology, cardiology, pediatrics, surgery, etc.)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written documents describing agreements with other services.</td>
<td></td>
<td>IAEA-TEC-118, chap.3, par.11.2.1, par.11.2.3</td>
</tr>
<tr>
<td>3.1</td>
<td>Does the nuclear medicine service have an updated written organizational chart, indicating chain of communication and line of authority?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Copy of the organizational chart (It could be also nettled on the Quality Manual).</td>
<td></td>
<td>IAEA-TEC-143, chap.4, par.5.4</td>
</tr>
<tr>
<td>4.1</td>
<td>Do the nuclear medicine diagnostic imaging and therapeutic services match with the clinical demand?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Check the patient non-referred there is waiting list.</td>
<td></td>
<td>IAEA-TEC-118, chap.3</td>
</tr>
<tr>
<td>5.1</td>
<td>Do the objectives of the nuclear medicine service include sufficient flexibility to accommodate with urgent requests and emergency examinations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Check the relevant SOPs and patient workload.</td>
<td></td>
<td>IAEA-TEC-118, chap.3.1.</td>
</tr>
<tr>
<td>6.1</td>
<td>Are the objectives of the nuclear medicine service included in the institutional strategy to quality improvement through of internal and external clinical audit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Check the quality objectives of the IMS.</td>
<td></td>
<td>IAEA-TEC-118, chap.1.3.1, par.4.4</td>
</tr>
<tr>
<td>7.1</td>
<td>Does the IMS have a strategic development plan for its global activities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written documents establishing the strategic development plans.</td>
<td></td>
<td>IAEA-TEC-118, chap.1.3.1</td>
</tr>
<tr>
<td>8.1</td>
<td>Does the service have a plan to provide new developments in diagnostic and therapy?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written documents describing the new developments (it could be nettled on the QMS).</td>
<td></td>
<td>IAEA-TEC-118, chap.3.1.1.3.1, par.5.3</td>
</tr>
<tr>
<td>9.1</td>
<td>If the IMS does not provide a full range of nuclear medicine services, is there a strategy to guide access to such services in another institution?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written agreements with other IMS Services/General SOPs for clinical and therapeutic services.</td>
<td></td>
<td>IAEA-TEC-118, chap.3.1.1.3.1, par.5.3</td>
</tr>
<tr>
<td>10.1</td>
<td>When providing services (e.g., technical and clinical) by external services at other hospitals, are responsibilities clearly defined?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Check the definitions of responsibilities of the IMS in the external services.</td>
<td></td>
<td>IAEA-TEC-118, chap.3.1.1.3.1, par.5.3</td>
</tr>
<tr>
<td>11.1</td>
<td>Is there a formal process ensuring participation of the service in decision-making of the hospital/institution?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Written SOPs describing the process to ensure the role of IMS in decision-making.</td>
<td></td>
<td>IAEA-TEC-118, chap.3.1.1.3.1, par.5.3</td>
</tr>
</tbody>
</table>

## LEGEND (Status)

| Conformance | Non-Conformance |
Conclusions

• **QUANUM audits**
  – Program easy to apply to all levels of NM practices
  – Introduces the concept of internal (self) auditing
  – Clinical services rendered with good standards
  – Radiation protection and radiopharmacy issues to be closely scrutinized

• **MPI clinical audit**
  – Technically difficult to run (raw data transfer)
  – High variability of results
  – Need to strengthen the basics
How to make an excellent Nuclear Cardiology report

Dr. Vikram Lele
Director
Department of Nuclear Medicine & PET-CT
Jaslok Hospital & Research centre
Mumbai, India
Structured report

• Contain sufficient information to convey details of the procedure and at the same time remain succinct
• Should provide basic “bottom line” result to the referring physician
ASNC IMAGING GUIDELINES FOR NUCLEAR CARDIOLOGY PROCEDURES

Standardized reporting of radionuclide myocardial perfusion and function

Peter L. Tilkemeier, MD,a C. David Cooke, MSEEB, Gabriel B. Grossman, MD, PhD,c,d Benjamin D. McCallister Jr, MD,e and R. Parker Ward, MDF

Journal of Nuclear Cardiology, August 2009, Volume 16, pages 650-
The IAC Standards and Guidelines for Nuclear/PET Accreditation

Published in September 15, 2016, go into effect March 15, 2017
Reporting nuclear cardiology: a joint position paper by the European Association of Nuclear Medicine (EANM) and the European Association of Cardiovascular Imaging (EACVI)

Elin Trägårdh1,2, Birger Hesse2, Juhani Knuuti3, Albert Flotats4, Philipp A. Kaufmann5, Anastasia Kitsiou6, Marcus Hacker7, Hein J. Verberne8, and Lars Edenbrandt1

Document Reviewers: Victoria Delgado, Erwan Donal, Thor Edvardsen, Maurizio Galderisi, Gilbert Habib, Patrizio Lancellotti, Koen Nieman, Raphael Rosenhek (for EACVI) and Denis Agostini, Alessia Gimelli, Oliver Lindner, Riemert Searl, and Christopher Übleis (for EANM)

1Department of Clinical Sciences, Clinical Physiology and Nuclear Medicine Unit; Lund University, Skåne University Hospital, Inga Marie Nilsson gata 49, 205 02 Malmö, Sweden; 2Department of Clinical Physiology, Nuclear Medicine & PET, Rigshospitalet, Copenhagen, Denmark; 3Turku PET Centre, University of Turku and Turku University Hospital, Turku, Finland; 4Nuclear Medicine Department, Hospital de la Santa Creu i Sant Pau, Universitat Autònoma de Barcelona, Barcelona, Spain; 5Cardiac Imaging, University Hospital Zurich, Zurich, Switzerland; 6Cardiology Department, Simeronoglio Hospital, Athens, Greece; 7Division of Nuclear Medicine, Medical University of Vienna, Vienna, Austria; and 8Department of Nuclear Medicine, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands

Received 20 November 2014; accepted after revision 24 November 2014; online publish-ahead-of-print 24 January 2015
Not All that Shines is Gold
Raffaele Giubbini

Nuclear Medicine Dpt
University & Spedali Civili, Brescia
PET Center of "Guido Berlucchi" Foundation
raffaele.giubbini@unibs.it
Fact & sensations!

There is a misconception that MRI, echo, and CT are superior to nuclear cardiology imaging because of their superior spatial resolution.

Yet, in detecting perfusion defects, what is really necessary is contrast resolution.

Superior contrast resolution allows us to differentiate between normal and hypoperfused myocardium facilitating the visual and quantitative analyses of nuclear cardiology MPI.

It’s all in the Numbers!!!

A/Prof Nathan Better
Cardiologist and Deputy director of Nuclear Medicine
Royal Melbourne Hospital
University of Melbourne
Australia

IMIC, Vienna – October 2016
Lots of options for quantitation !!

- Perfusion – SSS, SRS, SDS
- Function – LVEF, regional, wall thickness, diastole

- Semi-quantitative i.e you do it yourself!!
- Cedar – Sinai
- Emory tool box
- 4D – SPECT – good for getting your own lab normal data base, incl prone

In Australia, some of our patients are different to yours ……
Current PET Based Molecular Imaging Research in Cardiovascular Diseases: PET to the Future

Sharmila Dorbala, MD, FACC
Director of Nuclear Cardiology
Associate Professor Radiology

Friday, 14 October 2016; Time: 10:00-10:30
Session: Plenary session IX: The (he)art of imaging – techniques matter
Conclusions

- Targeted cardiovascular molecular imaging is the foundation for precision medicine
- Holds promise for
  - Early diagnosis
  - New drug development
  - Response to therapy
  - Improved outcomes
- Future research needed
Thank you very much to the ENTIRE IAEA TEAM