Interventional cardiology procedures involving eye lens exposure
What is interventional cardiology?
Electrophysiology

Cath Lab
1958: the first pacemaker implantation

Dr Ake Senning and team done first successful pacemaker implantation to a patient name Arne Iarsson with Stroke-Adam syndrome
40 years ago: the first coronary angioplasty

Andreas Gruentzig presenting poster at the 1976 AHA
Andreas Gruentzig 1st Performer Angioplasty in 1974
In 1977 performed 1st coronary angioplasty

Polyvinyl chloride balloon catheter with short guidewire attached to its tip.
Attività radiagnostica complementare:

Nella comune pratica clinica molti specialisti ricorrono all’ausilio delle apparecchiature di diagnostica per immagini che emettono radiazioni ionizzanti (es. cardiologhi, chirurghi vascolari, gastroenterologi, ortopedici, urologi, ecc.). Le attività radiodiagnostiche complementari si definiscono pertanto come quelle di ausilio diretto al medico chirurgo o all’odontoiatra per lo svolgimento di specifici interventi di carattere strumentale propri della disciplina, purché contestuali, integrate e indilazionabili, rispetto all’espletamento della procedura specialistica (art. 2 comma 1b DL.vo 187/2000) (2).

La responsabilità dell’atto radiologico nell’utilizzo complementare e della relativa esposizione del paziente ricade sul medico specialista competente per la specifica procedura (DL.vo 187/2000 art. 2, 5-8, 12)

Professional figures involved in interventional radiology

- doctor
- medical physicist
- radiologist technician
- nurse
Electrophysiology
Catheter

- Body of catheter
- Connector
- Fixing mechanism
IMPLANTATION (Transvenous access)

- Puncture of subclavian vein
- Puncture of axillary vein
- Isolation of cephalic vein

*The electrode is introduced into the vein with the aid of a vein retractor*
Unicameral device

Atrial stimulation

Ventricular stimulation
Dual-chamber device
Pace-maker
What is AICD?

Pacemaker + DAE = AICD

Early recognition and call for help
- to prevent cardiac arrest
- to buy time
- to restart the heart

Early CPR
- to restart the heart

Early Defibrillation
- to restore quality of life

Post resuscitation care
How ICD works?

- Heart rate
- Morphology
- Duration

- ATP
- Shock

Algorithm of discrimination
Implantable-cardioverter defibrillator (ICD)
Cardiac Resynchronization Therapy (CRT)
ABLATION
Transvenous access

Sheat technique
Transvenous access
ELECTROCATHERETER
Interventional Arrhythmology

EHRA 2014 Practical Guide on Radiation Dose Reduction in Electrophysiology

Supplemental Video 2A:
Figure 8
Radiation free construction of LA geometry using a non-fluoroscopic mapping system

www.escardio.org/EHRA
Interventional Arrhythmology

Figura 1. Ablazione di fibrillazione atriale utilizzando la tecnologia CARTOMERGE.
Interventional Arrhythmology
Considerare eventuali delibere assessoriali regionali sui requisiti degli EP lab.
EP Lab (2)
In EP Lab...
RAO
LAO
Recommended use of at least two dosimeters, one above and one underneath the lead apron.
Shielding measures during EP procedures.
Figure 6 Fluoroscopic imaging with lower dose settings often suffices for EP applications (right PV isolation).
## Interventional Arrhythmology

<table>
<thead>
<tr>
<th>procedures</th>
<th>2017</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM implantation</td>
<td>282</td>
<td>285</td>
</tr>
<tr>
<td>ICD implantation</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>CRT</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Ablation with NAVEX</td>
<td>23</td>
<td>1</td>
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<tr>
<td>Ablation with CARTO</td>
<td>64</td>
<td>101</td>
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<tr>
<td>Mapping</td>
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<td>3</td>
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<tr>
<td>SEF</td>
<td>13</td>
<td>23</td>
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<tr>
<td>EPS+CARTO</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Ablation with radiation exposure</td>
<td>14</td>
<td>21</td>
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<tr>
<td>Totale</td>
<td>466</td>
<td>520</td>
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Interventional Arrhythmology

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Radiation Exposure (min)</th>
<th>Duration of Procedure (min)</th>
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</thead>
<tbody>
<tr>
<td>PM</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>ICD</td>
<td>6</td>
<td>62</td>
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<tr>
<td>CRT</td>
<td>23</td>
<td>165</td>
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<tr>
<td>Conventional Ablation</td>
<td>13</td>
<td>88</td>
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<tr>
<td>Ablation with Carto</td>
<td>7</td>
<td>182</td>
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<tr>
<td>Ablation with Navex</td>
<td>4</td>
<td>122</td>
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<tr>
<td>EPS</td>
<td>13</td>
<td>70</td>
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</table>
Table 3
Typical patient radiation doses for common EP procedures

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Dose to patient mSv median and range</th>
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<tbody>
<tr>
<td>Diagnostic EP study</td>
<td>3.2</td>
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<tr>
<td></td>
<td>1.3–23.9</td>
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<tr>
<td>Ablation procedure</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>1.6–59.6</td>
</tr>
<tr>
<td>AF</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>6.6–59.6</td>
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<tr>
<td>AT – AVNRT – AVRT</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>1.6–25</td>
</tr>
<tr>
<td>VT</td>
<td>12.5</td>
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<tr>
<td></td>
<td>3–≥45</td>
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<tr>
<td>VVI/DDD PM or ICD implant</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1.4–17</td>
</tr>
<tr>
<td>CRT implant</td>
<td>22</td>
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<tr>
<td></td>
<td>2.2–95</td>
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<tr>
<td>Coronary angiography</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2.0–16</td>
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<tr>
<td>Percutaneous coronary intervention</td>
<td>15</td>
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<tr>
<td></td>
<td>7–57</td>
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</tbody>
</table>
Cath Lab
Coronarography

Coronary vessel

Stenosis 25%

Stenosis 75%
Cath Lab

- Monitor for angiography
- Monitor for polygraph
- Monitor IVUS
- Monitor review

- Digital angiography
- Angiography table
- Radiation protection
- Injector
- Control unit
Transvenous access for coronaryography

femoral

radial
Catheters for coronarography
Catheters for coronaryography

Radial access
- Right coronary artery
- Left coronary artery

Femoral access
- Right coronary artery
- Left coronary artery
Angiographic Projections
Coronarography

Right coronary artery

LAO 30°
Coronarography

Right coronary artery

CRA 30°
Coronarography

Left coronary artery

RAO 30° CAU 10°

Standard projection for Cx
Coronarography

Left coronary artery

CRA 30°

Standard projection for IVA
Coronarography

Left coronary artery

CAU 30°

CX-IVA
Coronarography

Left coronary artery

Spider

Standard projection for main left coronary artery
Ventriculography
Aortography

LAO 30° - CRA 10°
Coronarography

Coronary vessel  Stenosis 25%  Stenosis 75%

Angioplasty
Angioplasty

Thromboaspiration

manual

Angiojet
Angioplasty
Angioplasty

IVA after thromboaspiration
Peripheral Angioplasty

superficial femoral artery
Peripheral Angioplasty

Posterior tibial artery
Stenting in carotid artery
Staff in Cath Lab

Cath Lab Y

Cath Lab Arezzo

Cath Lab X

Doctor

Nurse

Radiology Technician
The presence of radiology technician next to the doctor during procedures in Cath Lab reduce radiation exposure (50% of total DAP) and time procedure (30%).

A third operator does not improve the management of work.
Smart guide to reduce radiation

1. Take two steps back from the table during imaging

2. Use proper positioning of the C-arm in relation to the patient

3. Use lead drapes under the patient table to reduce scatter radiation

4. Lower the frame rate on the imaging system

5. Use more supplemental imaging like optical coherence tomography (OCT), intravascular ultrasound (IVUS) and transesophageal echo (TEE) instead of fluoro

6. Work with radiologist technician during procedure
Thanks for your attention!