

13th EAN Workshop - “ALARA and the Medical Sector”
7-10 June 2011 - Oscarsborg (Norway)

**The ISEMIR project:
staff exposure in interventional cardiology**



**European
ALARA
Network**

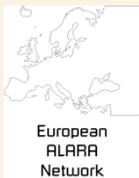
Renato Padovani

The IAEA ISEMIR project

- Arising from the Occupational Radiation Protection International Action Plan
 - Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR)
- Set up in January 2009 for a 3 year period, to help improve occupational radiation protection in targeted areas: interventional cardiology, industrial radiography

WG on Interventional Cardiology – mandate

- World-wide overview of occupational exposures in IC
- Identification of good practice
- Harmonization of monitoring of staff in IC
- Establish system for regular collection of occupational doses in IC, with analysis of results and dissemination of information



Members

- **Renato Padovani** (Chairperson), medical physicist
University Hospital, Udine, Italy
- **Ariel Duran**, interventional cardiologist
Servicio de Hemodinamia de Adultos
Montevideo, Uruguay
- **Donald L. Miller**, interventional radiologist
Center for Devices and Radiological Health, Food and Drug Administration, USA
- **Sim Kui Hian**, interventional cardiologist
Sarawak General Hospital, Sarawak, Malaysia
- **Eliseo Vano Carruana**, medical physicist
Complutense University, Madrid, Spain

IAEA staff members:

- **John Le Heron** (Scientific Secretary)
- **Madan Rehani**
- **Abraham Mundiyanickal**
- **Christian Lefaure** (IAEA consultant)



Actions performed

1. Surveys

- Survey: World-wide overview
- Survey to collect staff exposure data

2. International database design

3. Recommendations on occupational RP in IC

1. Survey: World-wide overview

- Questionnaires on present status of personal monitoring and doses in IC
 - Regulatory Body
 - Interventional cardiologists
 - Individuals
 - Chiefs

Cardiologists - results

- Caveats
 - A “convenience” sample
 - Cannot assert to be truly representative of worldwide practice
 - Perception versus reality
 - Cardiologists were asked questions on their own behaviour

Results from the survey probably give an over-optimistic picture

Interventional Cardiologists – summary of results

- **Personal monitoring**
 - 76% claimed that they always used their dosimeter
 - 45% stated they always used 2 dosimeters
- **Habits re protective tools**
 - 97% stated they always wear an apron
 - 43% stated they always wear protective glasses
- **Radiation protection training**
 - 83% claimed to have had RP training
 - 52% said they had certification in RP

Results from the survey probably give an over-optimistic picture

Behavioural effects of RP training - 1

	No RP training	RP certification
Always wears their dosimeter	56%	88%
Always wears 2 dosimeters	26%	57%
Knows their own personal doses	35%	82%
Knows their patient doses	12%	60%

Behavioural effects of RP training - 2

	No RP training	RP certification
Always wears an apron	85%	100%
Always wears eye protection	41%	46%
Always uses ceiling screen	71%	79%
Always uses table curtain	59%	79%

Regulatory Bodies

- Questions addressed
 - Numbers of persons in IC being monitored
 - Dose data for IC personnel
 - Requirements for monitoring
 - Number of dosimeters
 - Position
 - Requirements for radiation protection training

RB responses

191 RBs contacted, 82 responded (43%)

Responding RBs covered 24% of world pop

Only 36% of responses had valid data on IC
personnel doses

No central dose register

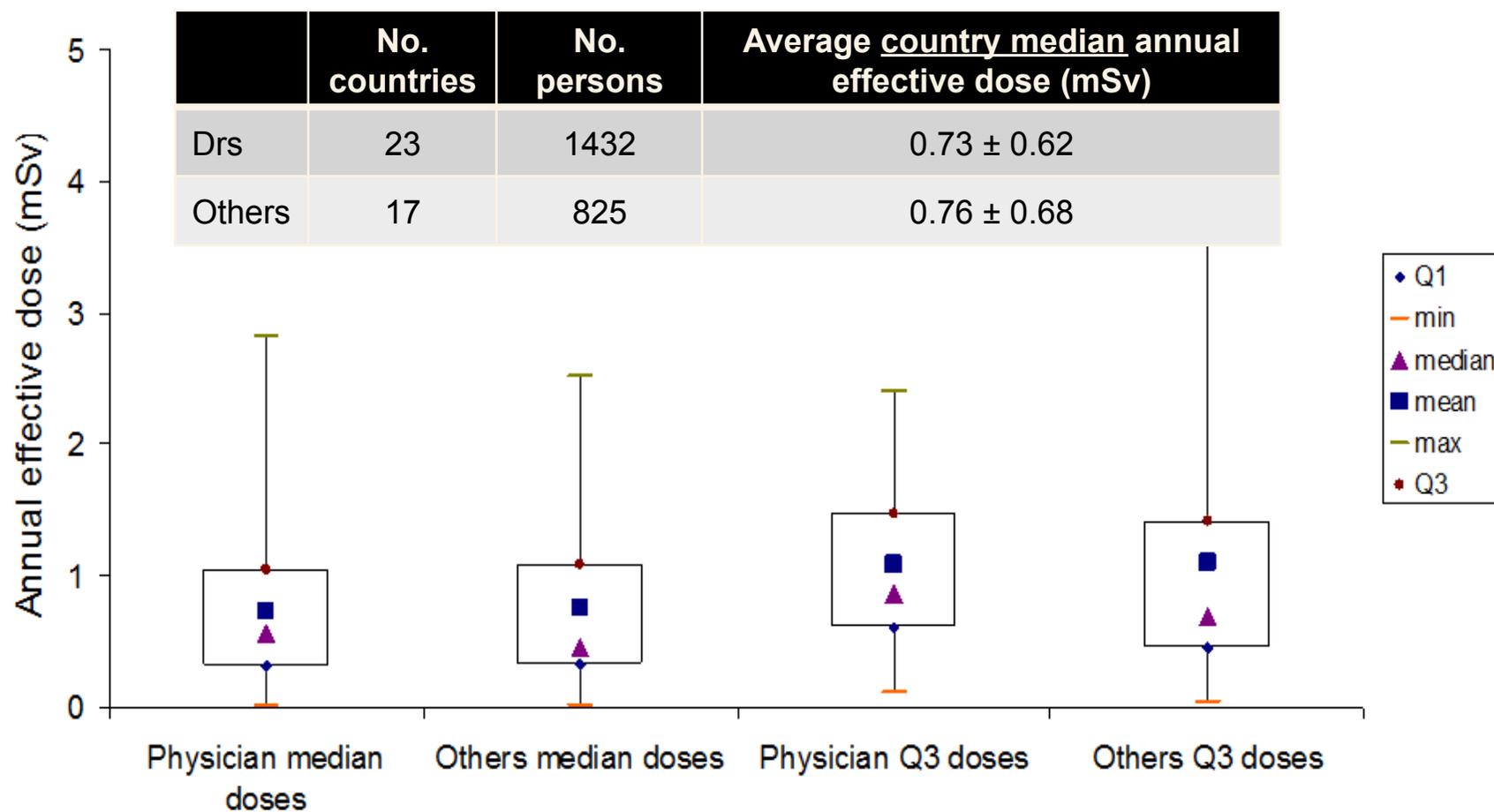
Register not readily accessible by RB

Register only contained doses higher than
some action level

Register existed, but no classification for IC

Reported doses for 2008 – 1080 persons

Distributions of country median & third quartile annual effective doses for physicians and for other personnel, in 2008



Are these values truly representative?

- Probably not
 - Lower than facility-specific estimates
 - Major issue with dosimeters not being worn

2009 Survey - conclusions

- Both the cardiologists' and the regulatory body surveys indicate that there is scope for improvement in occupational RP in IC
- Implications for establishing a world-wide IC dose database
 - RBs probably not the best source of dose data
 - Compliance with wearing dosimeters is an issue

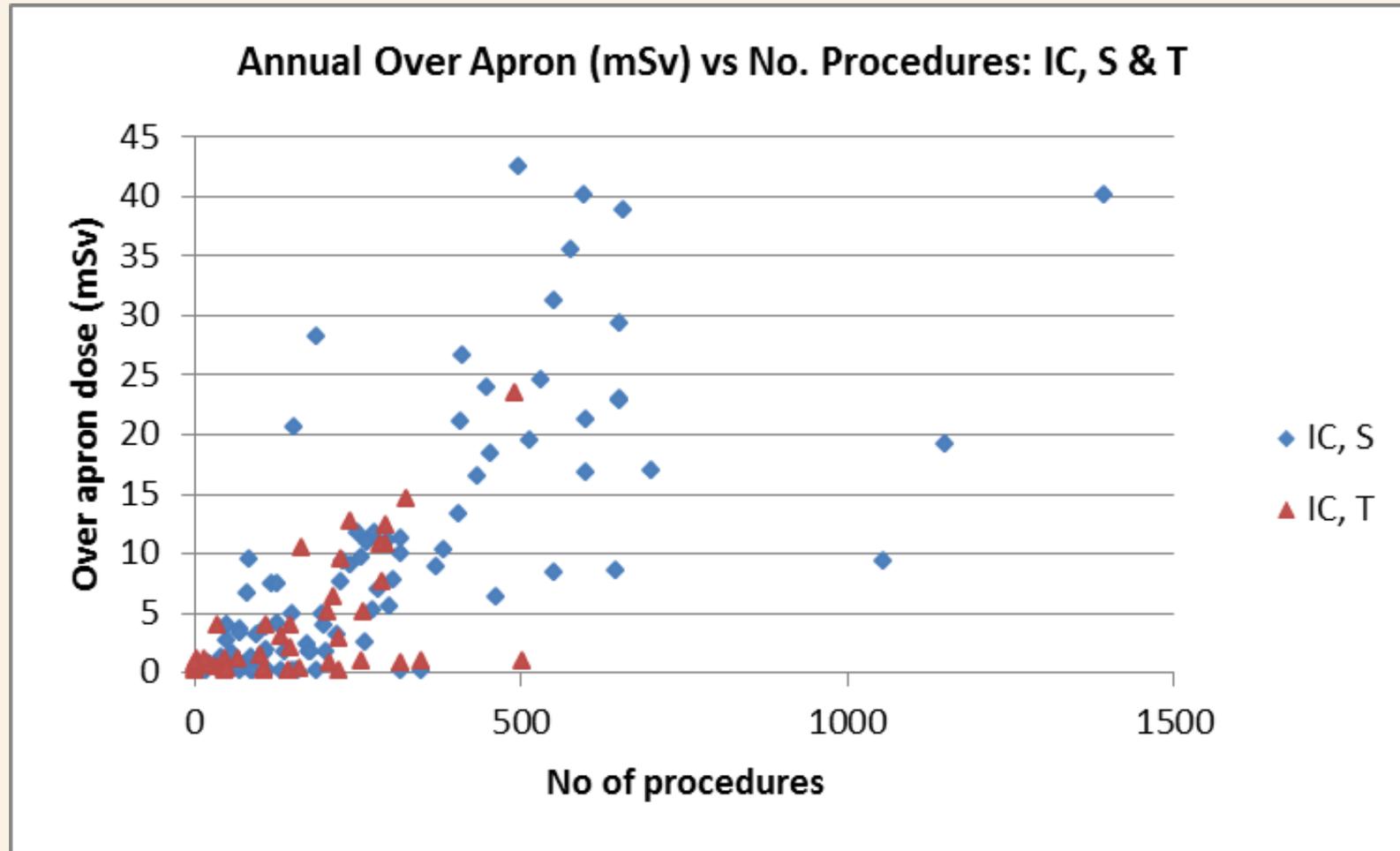
Survey – obtaining staff exposure data

- A systematic approach to make collection regular and easy
 - Identification of essential database contents
 - Data collection method
 - IC facilities directly
 - Better identification of persons, roles, workloads
 - Better control over the dosimetry
 - Some scope for assessing wearing compliance
 - Need to convince the facilities re the added value of participating

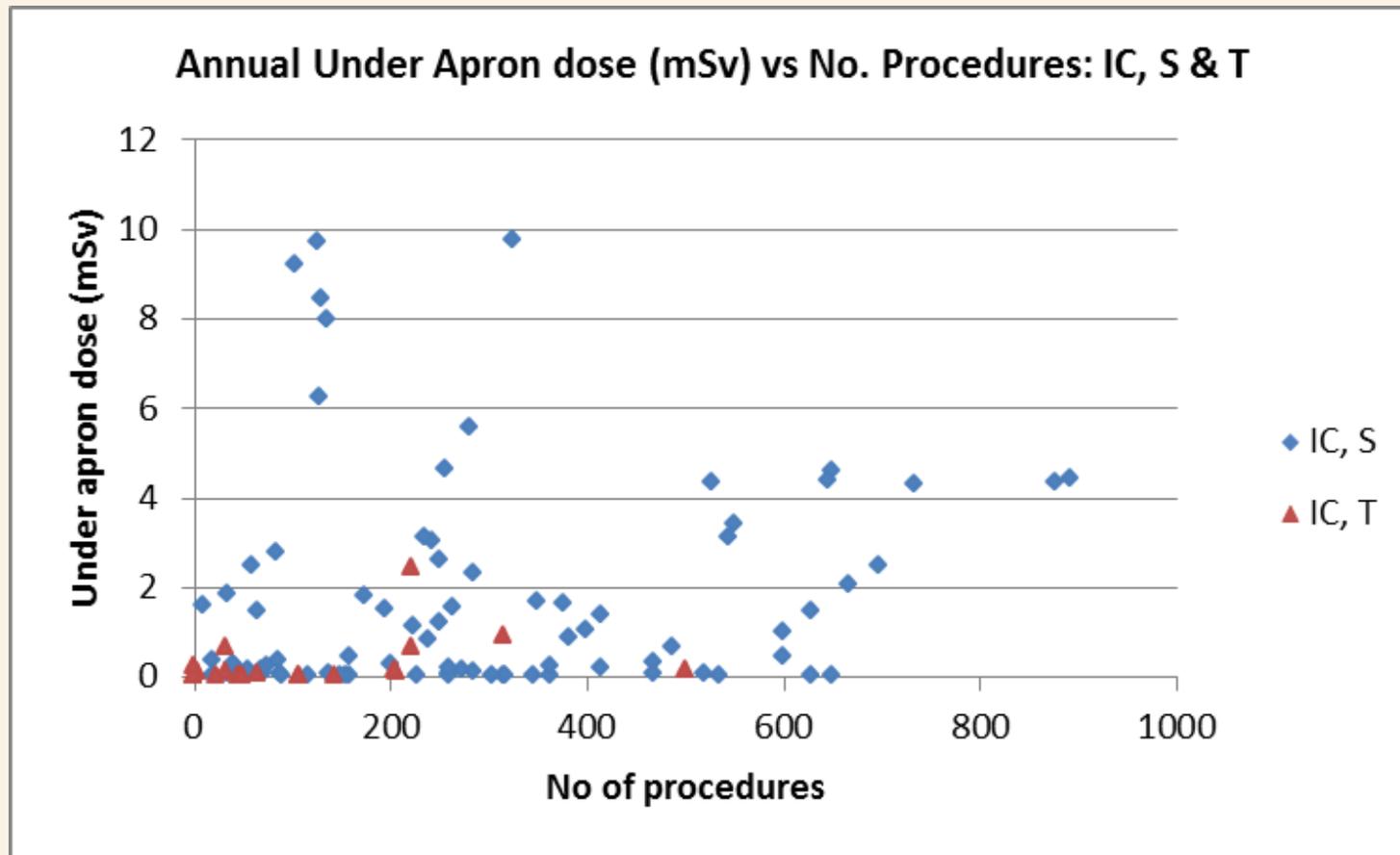
IC facility pilot survey on obtaining data

- IC centres:
 - > 100 contacted
 - Only 25 EoI
 - 20 provided data
- As an overall comment:
 - 50% of the data demonstrate the poor quality of staff monitoring data

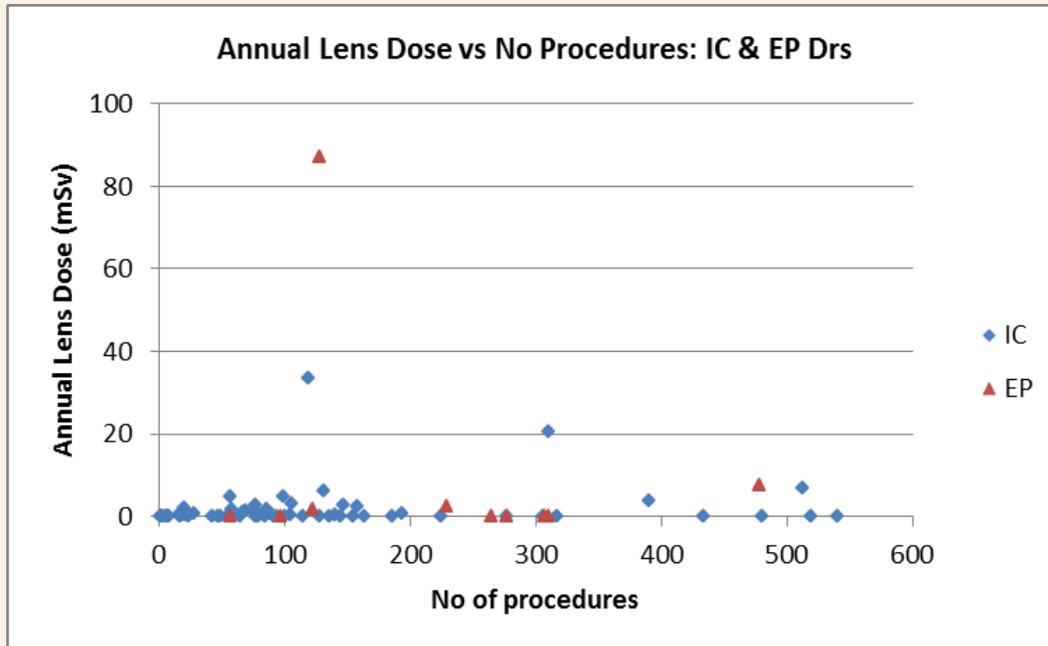
Over apron dose data – IC Doctors



Under apron dose data – IC Doctors



Lens doses / year (mSv)



Over-apron & lens data

n	265
mean	5.4 mSv
min	0
median	1.4
max	87
> 10 mSv	20%
> 20 mSv	8%

76 had “zero” lens dose
- Good practice?
- Poor compliance?

Max values (higher than recent ICRP eye dose limit recommendation) are an indication of poor protection; “0” doses of poor monitoring

Metric for assessing optimization of ORP in IC

Dose per procedure

	n	Mean ($\mu\text{Sv}/\text{proc}$)	CV %
All Drs	298	9.2	360
IC only	244	10.6	340
EP only	45	3.0	117
IC, consultant	137	12.6	252
IC, trainee	41	16.3	402

Assessing the quality of the data

- Indices
 - Dose reporting consistency
 - Dose value consistency

QF2 = % of monitoring periods with a reported measurement

QF3 = Coefficient of variation, Over Apron measurements

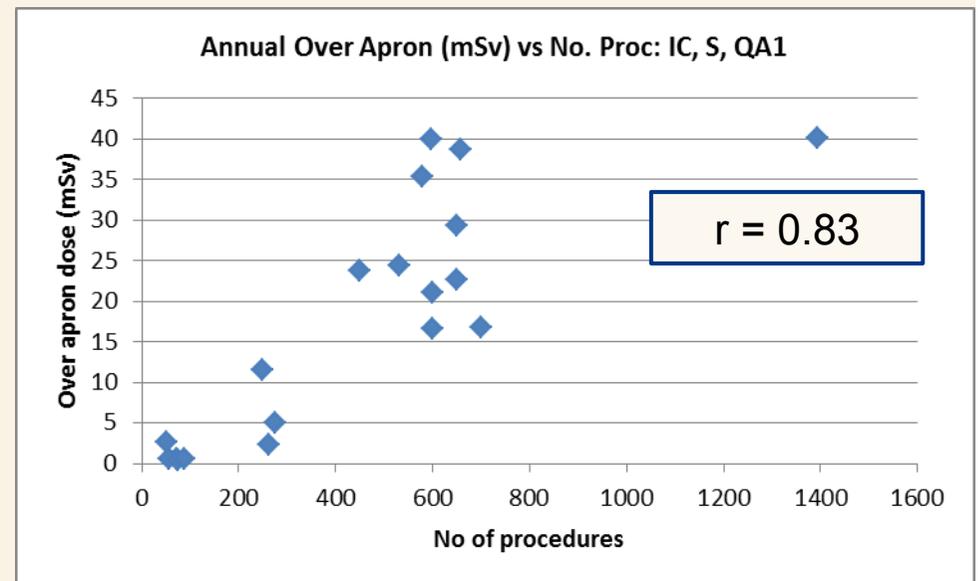
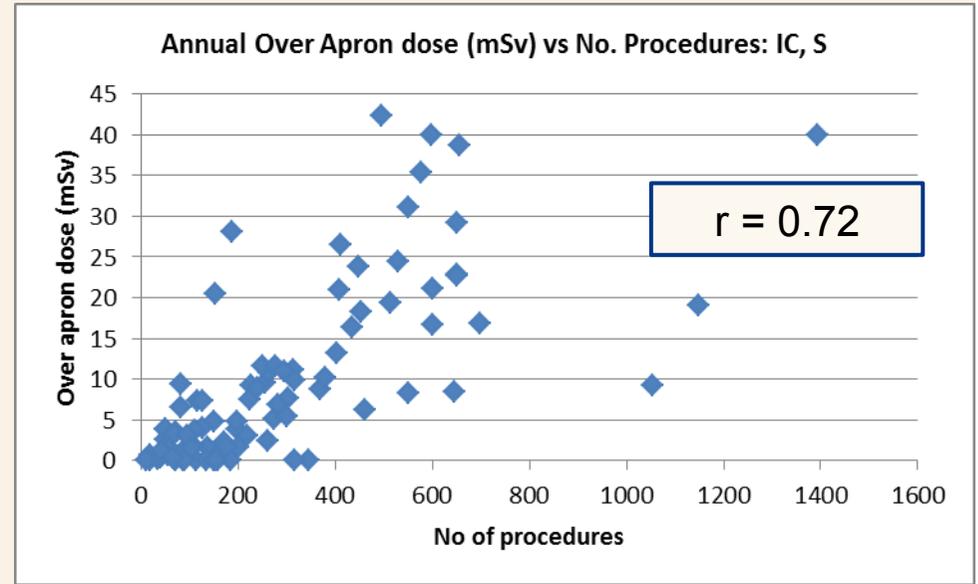
QF4 = Coefficient of variation, Under Apron measurements

QA1: true if $(QF2 > \text{Test2})$ AND $(QF3 \text{ OR } QF4 < \text{Test 3})$

Test2	Test3
75.00	50.00

Effect of Quality – Annual Over apron, IC, S

Annual Over apron AND no. of procedures known						
	No. data	Ave	SD	Min	Median	Max
IC+S	93	9.26	10.80	0.00	5.04	42.30
Over apron AND Good Quality AND no. of procedures known						
	No. data	Ave	SD	Min	Median	Max
IC+S	19	17.50	14.62	0.43	16.81	40.06



Pilot test on obtaining staff exposure data from IC facilities - conclusions

- Many data were of poor quality
- Some quality factors have been developed and tested to score the quality of the doses provided
- Filtered sets of data are providing dose levels in agreement with published data coming from detailed studies

2 - International database of IC staff doses (iDBIC)

- Why should IC facilities be interested in providing annual dose values to the iDBIC? They can have the following benefits:
 - At institution/hospital level:
 - Participation in an international action
 - External audit on worker safety as part of a quality assurance/accreditation programme
 - To receive recommendations to address higher safety standards in IC practice
 - At IC staff /medical physicists/RPO level
 - A tool for the optimization of ORP
 - Annual analysis of IC exposures
 - Comparison of doses with other institutions
 - Identification of areas for improvement
- And Regulatory Bodies
 - Benchmarking

iDBIC development

- Main characteristics:
 - iDB access from ISEMIR website
 - Data collection once a year from IC facilities responsible for input
 - Access to IC facilities for analysis and benchmarking with national/regional/global data
 - Access to RBs for global national data evaluation and benchmarking with regional/global data
 - Privacy to be assured to individuals and facilities

3 – Recommendations of staff protection

- Developed recommendations for staff protection and monitoring
- Updated in May 2011 after ICRP recommendations on new dose limits for eye lens exposure
- The recommendations have been endorsed by the most important international societies:
 - Asian Pacific Society of Interventional Cardiology (APSIC),
 - Latin American Society of Interventional Cardiology (SOLACI),
 - European Association of Percutaneous Cardiovascular Interventions (EAPCI),
 - Society for Cardiovascular Angiography and Interventions (SCAI)

Lessons learned from WGIC activities

- Identification of significant deficiencies in staff monitoring in most IC facilities
- Evidence of high frequency of lens injuries reinforce the need to put more resources in this area of RP

Conclusions

- International database can be a useful instrument to improve practice
 - the support of national RBs and IC facilities are key elements for the success of this initiative
- EAN and EMAN can play an important role
 - disseminating information, developing recommendations and education material
 - involving RBs to redesign national staff dose databases
 - involving scientific societies and IC facilities
- Industry
 - advanced dosimetry development
 - standards