SENTINEL "European Coordination Action"
Madrid, 21-22 April 2006

The Spanish survey on radiation dose and quality criteria in interventional radiology

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Friday, 21 April 2006		
Time	**Topic**	**Lecturer**
9:00 – 9:05	Meeting opening	E. Borrego
9:05 – 9:30	Introduction to European Coordination Action SENTINEL	E. Vano
9:30 – 10:00	Procedures in Interventional Radiology (IR)	J.J. Gallego
10:00 – 10:30	The Spanish Society of Vascular and Interventional Radiology (SERVEI) involved in the SENTINEL Programme	J. Urbano E. Vano
10:30 – 11:00	BREAK	
11:00 – 11:30	Detectors and measurement tools for IR • Measurement of DAP including DAP-meter calibration • Measurement techniques for ESD	H. Jarvinen
11:30 – 12:00	Patient dosimetry in IR • Dosimetry in 3D acquisition • Image evaluation in 3D reconstruction	R. Padovani
12:00 – 12:15	Discussion	
12:15 – 12:45	Training actions in IR	E. Vano
12:45 – 13:15	Quality control in IR	C. Prieto
13:15 – 13:30	Final discussion	E. Vano

SENTINEL
(European Coordination Action)

- **SENTINEL = Safety and Efficacy for New Techniques and Imaging using New Equipment to Support European Legislation (2005-2007).**
- **Spain (Complutense University and San Carlos University Hospital) is in charge of WP4: Efficacy and safety in high individual dose procedures.**

The Spanish survey on radiation dose and quality criteria in interventional radiology

• The National Survey was agreed in April 2005 between the Spanish Society of Vascular and Interventional Radiology (SERVEI) and the Complutense University as part of the European SENTINEL Coordination Action.
• A total of 11 hospitals from 6 Spanish Autonomous Communities were involved: 15 senior interventional radiologists and 15 medical physicists accepted the commitment in the project.

Sixth Framework Programme

Relevant aspects included in the programme

• Patient radiation doses (including skin dose distribution).
• Staff doses for the different procedures.
• Image quality and diagnostic information obtained.
• Typical protocols for the different procedures (with details on the number of series, volume of contrast media, complexity of the procedures, etc).
• Evaluation of the X ray systems, including clinical routine setting, constancy checks, calibration of the patient dose meters, DICOM conformance, etc.

Sixth Framework Programme

Benefits for the Medical Society

- **To maintain a high standard of quality and radiation safety in the practice of IR.**
- **To compare the Spanish IR practice with other countries and to correct some abnormal situations if detected.**
- **To inform patients and health authorities on the doses during fluoroscopy guided procedures.**
- **To optimise the use of X-ray systems, digital connectivity and image processing and to improve the use of catheters and contrast media for the best management of radiation doses.**

SOCIEDAD ESPAÑOLA DE RADIOLOGÍA VASCULAR E INTERVENCIONISTA

The Spanish Society of vascular and interventional radiology

Dr. José Urbano

SENTINEL (European Coordination Action)

- **The Spanish Society of Vascular and Interventional Radiology (SERVEI) agreed to be involved in the SENTINEL Action and to initiate a National survey on radiation dose and quality criteria in interventional radiology.**

S.E.R.V.E.I

Spanish Society of Vascular and Interventional Radiology

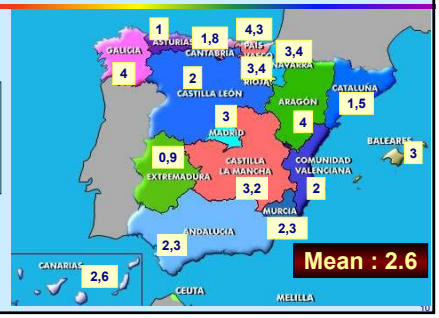
Number of hospitals with IR units (year 2004)

232 Interventional radiologists

S.E.R.V.E.I

Spanish Society of Vascular and Interventional Radiology

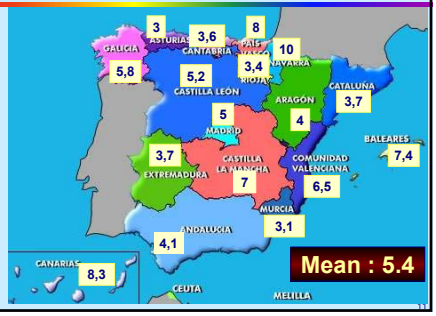
Hospitals with IR / million inhabitants (year 2004)



S.E.R.V.E.I

Spanish Society of Vascular and Interventional Radiology

Interventional radiologists / million inhabitants (year 2004)



S.E.R.V.E.I

Spanish Society of Vascular and Interventional Radiology

Year 2004

TOTAL NUMBER OF PROCEDURES: 157,274

678 Procedures / Radiologist and year

3,932 procedures / million inhab.
60% diagnostic
40% therapeutic

The benefits of the programme for the SERVEI

1. In addition to the patient and staff dose data knowledge, the possibility to improve image quality and diagnostic information.
2. Real possibility to balance clinical benefit versus radiological risk.
3. Improve the collaboration with medical physics experts.

SERVEI OBJETIVES OVER SENTINEL PROGRAM

- **A representative sample of the full country allowing comparisons between:**
  - Interventional rooms
  - Different hospitals
  - Different interventionalists
  - With other countries

Final product for the Medical Society

- To propose provisional national reference levels related with patient doses (indicative of good practice).
- To draft a Guideline on Quality Criteria and Radiation Safety for Interventional Radiology.

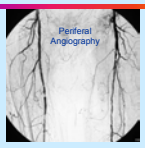
Sixth Framework Programme

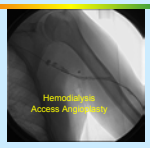
SENTINEL

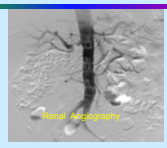
Procedures selected

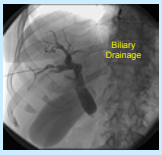
- **Diagnostic**
  - Lower limb aretriography
  - Renal arteriography
  - Fistulography
- **Therapeutic**
  - Hepatic Chemoembolization
  - Iliac PTA and stenting
  - Biliary drainage

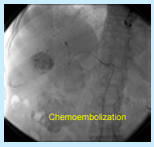
Procedures selected …

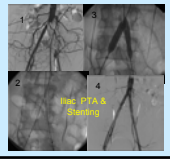












To be taken into account …

1. Large fluoroscopy time
2. Radiologist working close to the radiation source
3. Different positions for the operator
4. Anatomical areas and thickness very different
5. Large number of images and series
6. High level of scatter dose
7. Complex procedures with very ill patients
8. Broad kind of procedures
9. High workload

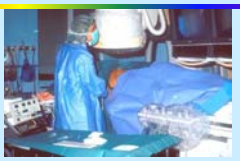
To be taken into account …

C-arm position and angulation

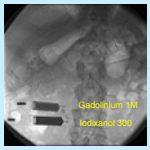
Staff position

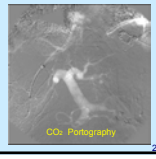
To be taken into account …

- Fellows
- Residents



What about contrast agent and Iodine concentration?





The medical physicist point of view …
(E. Vano)

To be taken into account …

- The radiation safety aspects during Interventional Radiology procedures are quite difficult to evaluate (more than in interventional cardiology).
- The relation between staff and patient doses is multifactorial and intricate.
- Improvements in the criteria to classify the complexity of the procedures are needed.

Questions to be answered in the future

- The best X ray system settings for the different procedures.
- The appropriate protocols for the procedures (number of series and frames, C-arm angulations, image intensifier or flat detector formats, default postprocessing, patient dose reports, connectivity with RIS and PACS, etc).
- Benefits of the rotational angiograhy.
- Contrast media, catheters and dose.
- How to audit and to minimise staff dose.

Some general results … (updated March 2006)

Hospitals involved

- Fundación Alcorcón Madrid
- Hospital Clínico San Carlos Madrid
- Hospital Clínico Valencia
- Hospital de Basurto Bilbao
- Hospital General Universitario Alicante
- Hospital Juan Ramón Jiménez Huelva
- Hospital Reina Sofía Córdoba
- Hospital Txagorritzu Vitoria
- Hospital Universitario de Canarias Santa Cruz de Tenerife
- Hospital Valle Hebrón Barcelona
- Fundación Jiménez Díaz Madrid

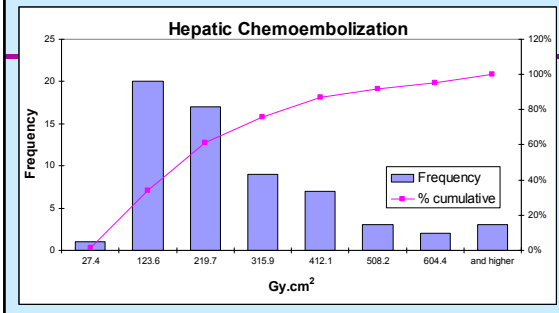
X ray systems involved

- General Electric (Advantx)
- Toshiba (CAS 8000 V)
- Philips (Allura FD)
- Philips (BV300)
- Toshiba (Infinix VC-1)
- Siemens (2000 Angio Star Plus)
- Siemens (Axiom Artis TA)
- Siemens (Polidoros 80)
- Philips (Integris 3000
- Philips (Integris Allura Image Intensifier)
- Philips (Integris 3000)
- Philips (Integris Allura Image Intensifier)
- Philips (Integris V3000)

Philips	54%
Siemens	23%
Toshiba	15%
GE	8%

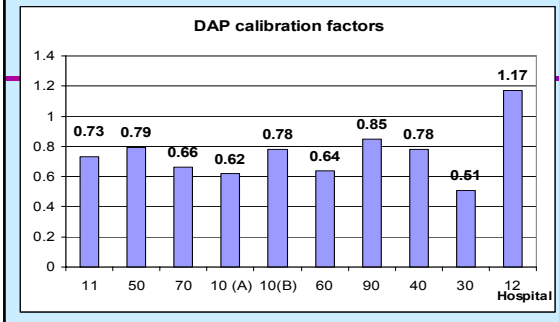
	SPANISH SURVEY					EEUU			
	Sample (173)	Median image number	Median fluoroscopy time min	Median DAP Gy.cm2	Mean DAP Gy.cm^2	Sample	Mean number of images	Mean DAP Gy.cm^2	Mean fluoroscopy time (min)
Biliary drainage	92	6	11.5	23.7	58.9	123	15	70	23.3
Hepatic chemoembolization	57	102	17.8	174.0	210.6	126	216	282	16.8
Iliac Stent	24	51	5.4	56.7	86.3	93	159	213	21.6

Spanish mean values are 16-60% lower than the USA values.
But mean value is not the good descriptor for these patient dose distributions.



Procedure	Number of cases (461)	MAX Gy.cm2	MIN Gy.cm2	MEDIAN Gy.cm2	MEAN Gy.cm2	third quartil Gy.cm2	std deviation Gy.cm2	median images	median time (min)
DIAGNOSTIC									
Fistulography	99	82.8	0.6	3.7	9.4	9.9	14.1	58	1.3
Lower Limb arteriography	167	223.6	3.0	60.2	63.8	83.9	41.0	118	2.5
Renal arteriography	22	162.5	15.4	38.5	45.8	47.8	31.9	48	1.7
THERAPEUTIC									
Biliary drainage	92	337.8	1.0	23.7	58.9	87.2	71.2	6	11.5
Hepatic chemoembolization	57	700.6	27.4	174.0	210.6	291.2	160.8	102	17.8
Iliac Stent	24	449.5	14.1	56.7	86.3	90.3	100.8	51	5.4

Belgium survey 2004-05: DRL for LLA (3rd quartile): 90 Gy.cm^2



Calibration correction ranges from 0.51 to 1.17 (a factor of 2.3)