

# ETRAP -2005



Some results after three years of using the European Multimedia Course for Training on Radiation Protection for Interventional Radiology.



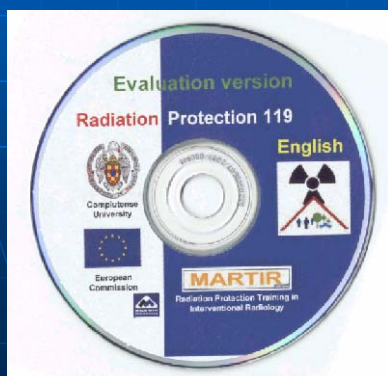
E. Guibelalde, E. Vañó, L. González  
Radiology Department. Complutense University. Madrid. Spain

1

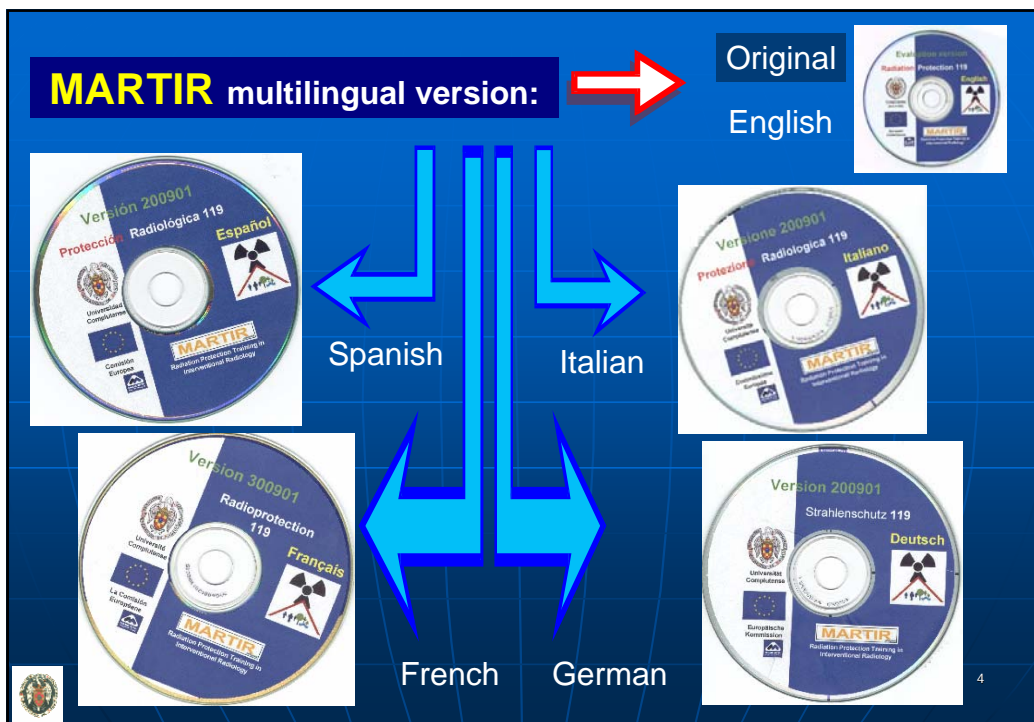
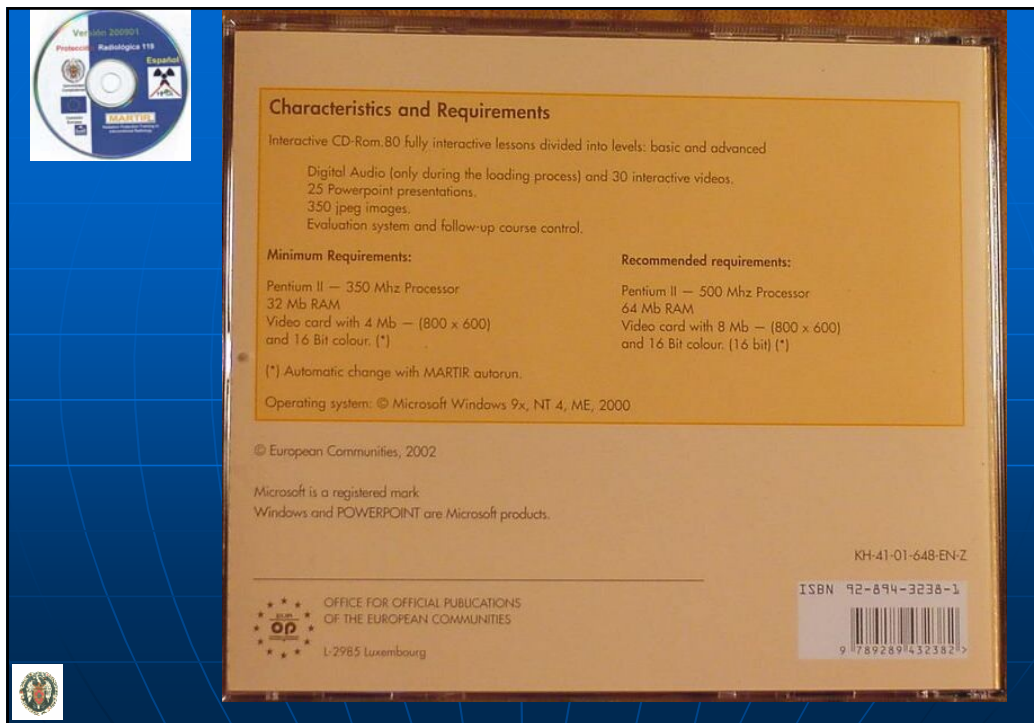
**M**ultimedia and  
**A**udiovisual  
**R**adiation Protection  
**T**raining in  
**I**nterventional  
**R**adiology



**MARTIR Project. European Commission 2002**

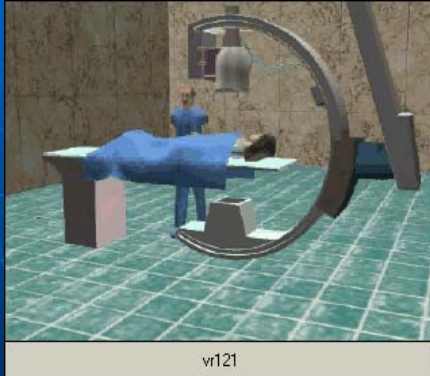


2



## MARTIR Video I

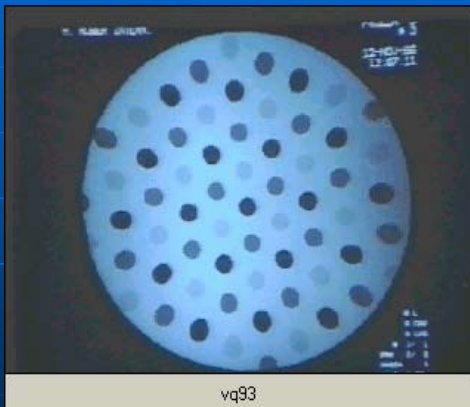
## Basic aspects of radiation protection



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## MARTIR video II

## Basic aspects of Quality Control



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## MARTIR interactive CD – Main characteristics



### It is allowed:

- To select different levels of training
- To follow a training programme as a regular course (step by step) or looking only for the topics of interest.
- To do some autoevaluation exercise at the end of the different sections or topics.



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The CD-ROM can be used as a bibliographic manual to review the knowledge on radiation protection in Interventional Radiology. CD contains 80 lessons with their texts, 350 images, 30 videos, 25 power point slide presentations and a good collection of references and links updated for the year 2001. This material is not protected so that people can use it freely, assuming a proper use of EC copyright and referring the source.

fatom01	fdosi1	fstoc01
fatom02	fioni01	fstoc02
fatom03	fioni02	fstoc03
fatom04	fioni03	fstoc04
fatom05	fioni04	fstoc05
fathe01	flesion01	fstoc06
fathe02	flesion02	fstoc07
fathe03	flesion03	fstoc08
fcohe01	flesion04	fstoc09
fcomp01	flesion05	fstoc10
fcomp02	flesion06	fstoc11
fdete01	fpdevic01	fstoc12
fdete02	fpdevic02	fstoc13
fdosa01	fpdevic03	fstoc14
fdosa02	fpdevic04	fstoc15
fdosa03	fpdevic05	tmer01

350 images



30 videos

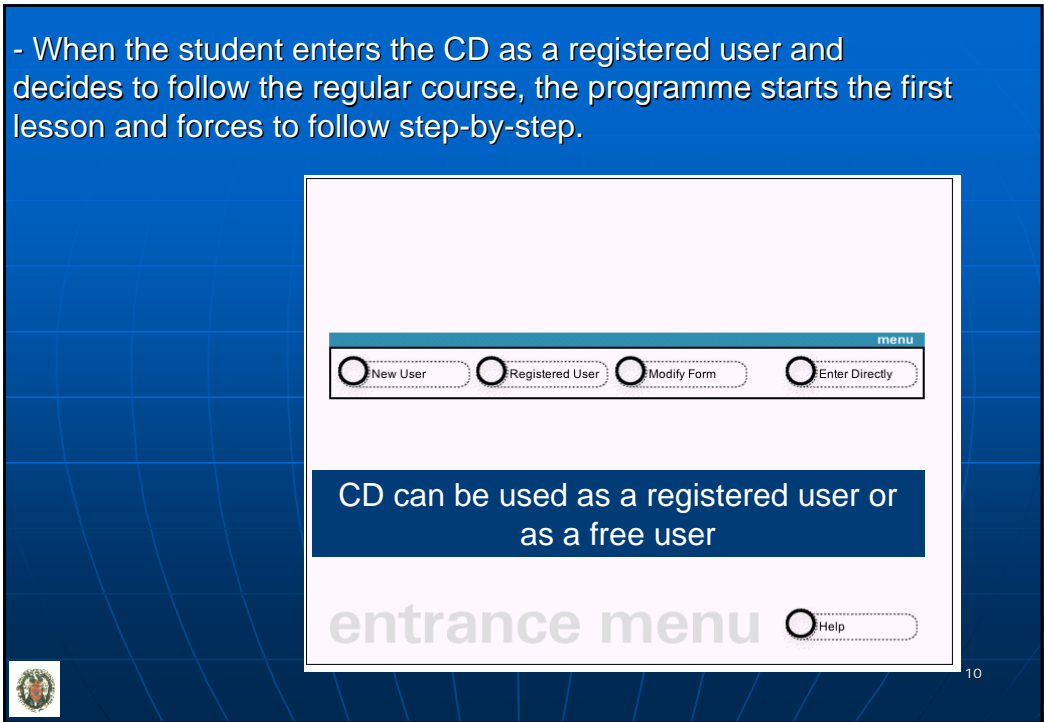
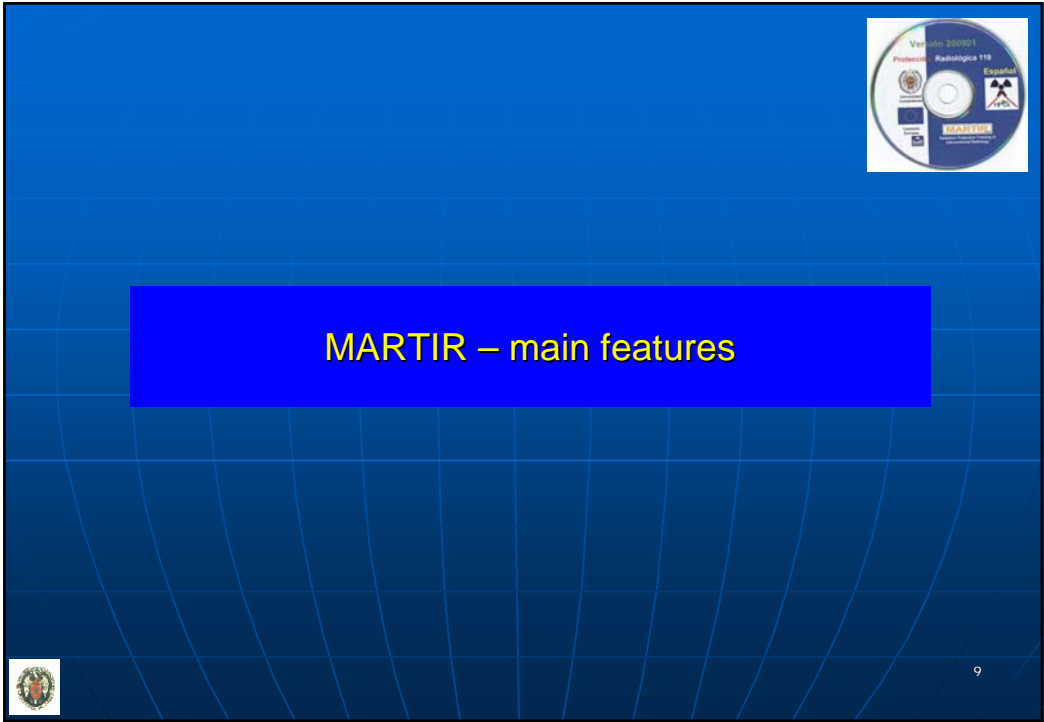
vq121	vr122	vr312
vq131	vr123	vr51
vq171	vr124	vr61
vq172	vr131	vr81
vq173	vr132	vr91
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vq92	vr261	vt202
vq93	vr31	vt231
vr121	vr311	vt51

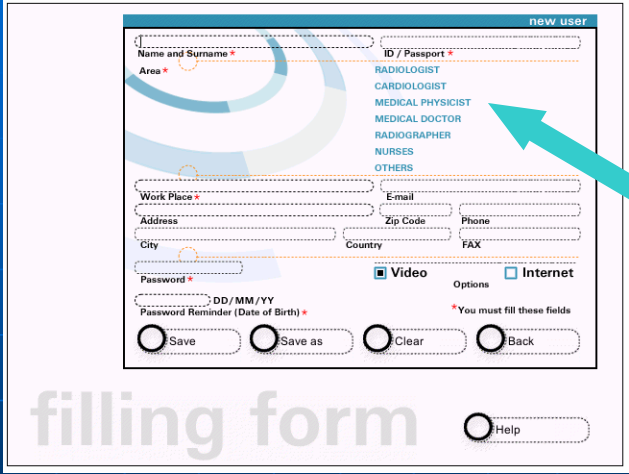
tpbar01	geurop03	trpskin01
gecal01	geurop04	trsdosi01
gecons01	geurop05	trsdosi02
gecons02	geurop06	tl6form
gecons03	geurop07	tlacce01
gecons04	geurop08	tsiem01
geimp01	qana01	
geuni01	rpcomp01	
geurop01	rppea01	
geurop02	rpsize01	

25 Power Point presentations



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The screenshot shows a 'new user' registration form with the following fields and options:

- Name and Surname \*
- ID / Passport \*
- Area \* (dropdown menu with options: RADIOLOGIST, RADIOLOGIST, MEDICAL PHYSICIST, MEDICAL DOCTOR, RADIOGRAPHER, NURSES, OTHERS)
- Work Place \*
- E-mail
- Address
- Zip Code
- Phone
- City
- Country
- FAX
- Password \*
- DD/MM/YY
- Password Reminder (Date of Birth) \*
- Options:  Video,  Internet
- Buttons: Save, Save as, Clear, Back
- Help

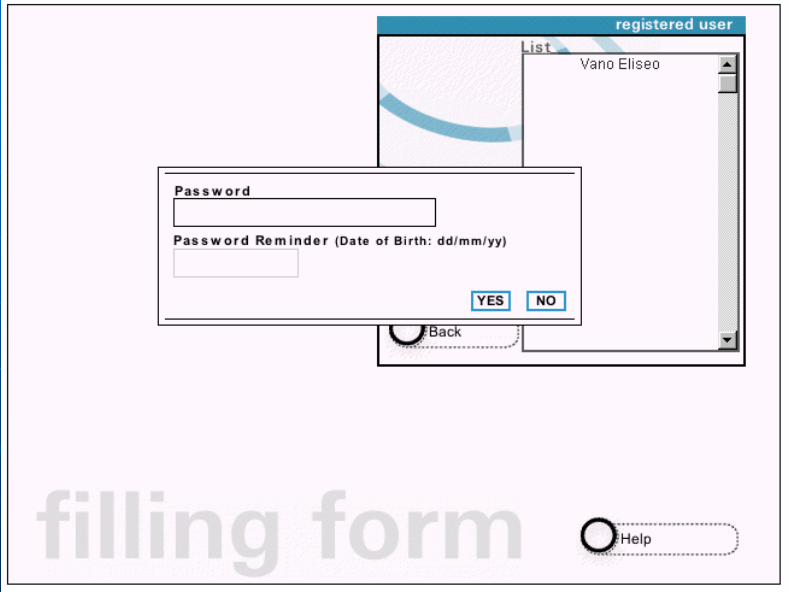
**filling form**

As a registered user your personal data are required

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Different levels of training can be selected (for radiologists, cardiologists, medical physicists, radiographers)

As a registered user your working time is measured in every session



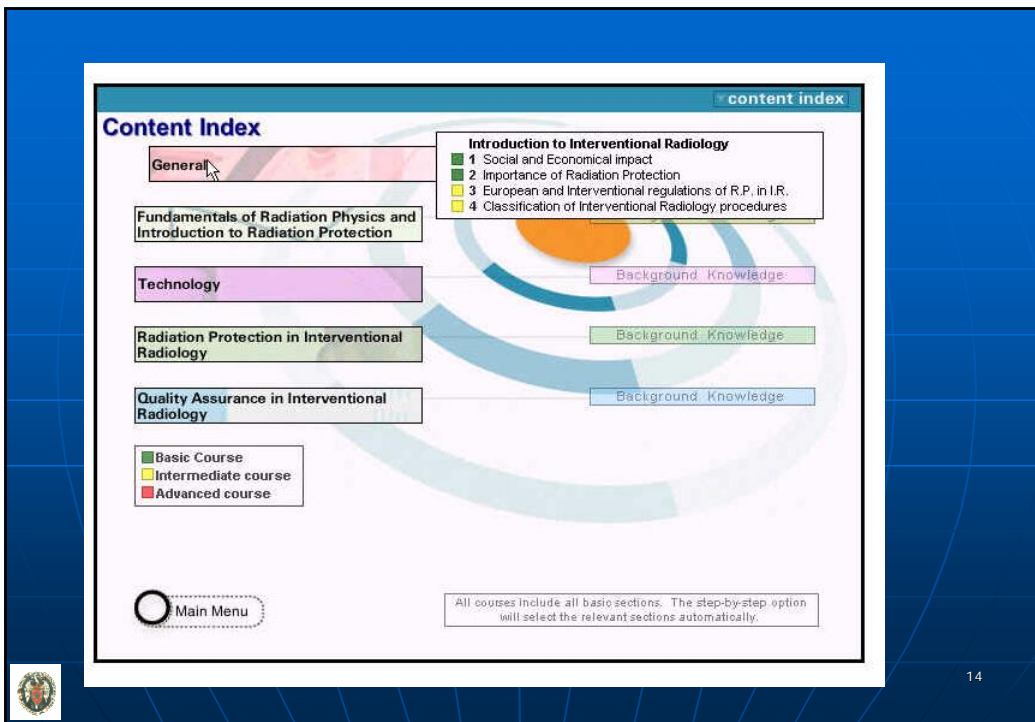
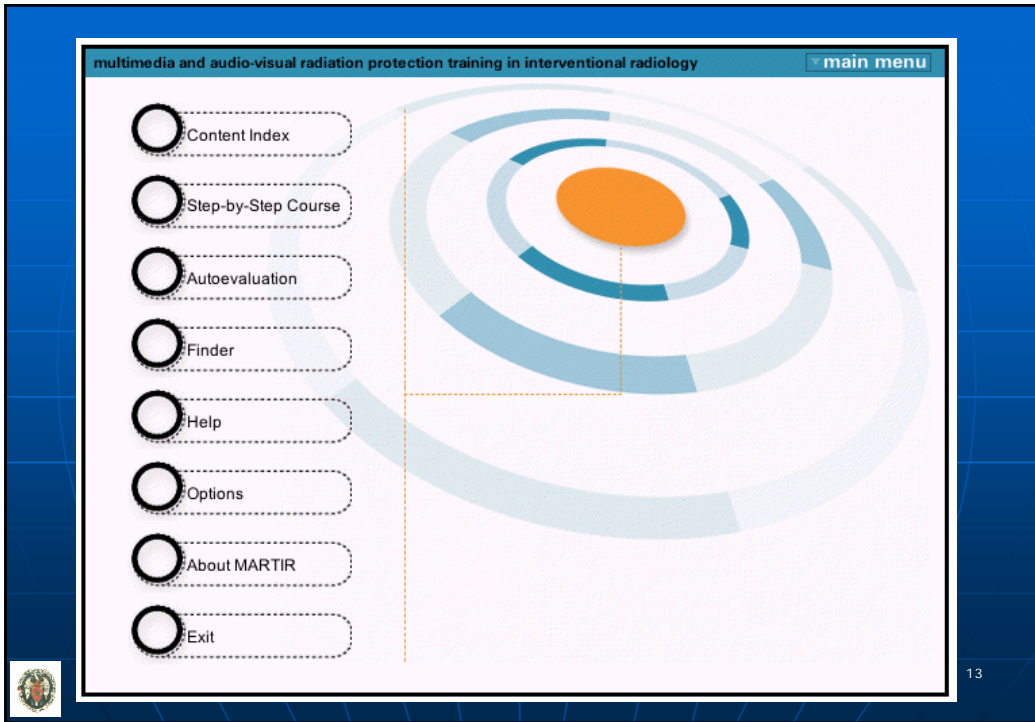
The screenshot shows a 'registered user' interface with a 'List' box containing 'Vano Eliseo' and a 'Password' dialog box with the following fields and buttons:

- Password
- Password Reminder (Date of Birth: dd/mm/yy)
- Buttons: YES, NO, Back
- Help

**filling form**

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- The course is organized in five chapters (General, Fundamentals of Radiation Protection Physics, Technology, Staff and Patient Radiation Protection, Quality Control)

**Content Index**

General

Fundamentals of Radiation Physics and Introduction to Radiation Protection

Technology

Radiation Protection in Interventional Radiology  
Click here to start this section

Quality Assurance in Interventional Radiology

Basic Course  
Intermediate course  
Advanced course

Main Menu

**Radiation protection of the staff**

- 40 Dosimetry and Dosimetric methods
- 41 Literature surveys on staff doses  
Influence of personal protection devices
- 42 Suspended screens and curtains
- 43 Lead aprons
- 44 Protective gloves
- 45 Eye protection
- 46 Thyroid protection
- 47 Influence of X-ray equipment technical parameters...  
Influence of relative position of the staff  
to the patient and X-ray tube
- 48 to the TV monitors inside the room
- 49 Influence of staff training

**Radiation protection of the patient**

- 51 General aspects of dosimetry methods  
Dosimetric methods
- 52 Entrance Surface dose
- 53 Dose area product
- 54 Organ doses and effective dose
- 55 Slow film method
- 56 Other skin dosimetry methods
- 57 Diagnostic Reference Levels  
Influence of X-ray equipment technical parameters
- 58 Image acquisition modes
- 59 Collimation and magnification
- 60 Influence of complexity of procedures
- 61 Influence of the patient relative position to X-ray tube...
- 62 Influence of the projection
- 63 Influence of the patient size
- 64 Influence of removing the grid

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When you follow the step-by-step course, it is necessary to pass a short auto evaluation test to be able to go next chapter. This feature allows an external survey of the student progress.

Radiation Protection in Interventional Radiology background knowledge index

Question 2/5

The use of antiscatter grid:

- increases radiation dose to staff.
- usually improves image quality.
- increases skin patient dose.
- decreases skin patient dose.
- decreases radiation dose to staff.

Answers: [F] [F] [T] [T] [T]

Time: 00:00:52 Correct: 1 / 5 Wrong: 4 / 5 Results

continue

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Radiation Protection in Interventional Radiology

Radiation protection of the staff  
Influence of personal protection devices  
Lead aprons

Lesson 43/80

Images  
Video  
History  
Print Section  
Objectives  
Finder  
Back

**objectives**

Radiation protection of the staff  
Influence of personal protection devices  
**Lead aprons**

- 1 To analyse the effects of using lead aprons as personal protection.
- 2 To discuss how using and handling lead aprons correctly.
- 3 To discuss how effective doses are affected by the use of lead aprons.

global objectives      section objectives

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Technology

Introduction to dedicated I. R. - X-ray equipment  
Image systems  
TV Monitors

Lesson 30/80

Images  
Video  
History  
Print Section  
Objectives  
Finder  
Back

**BASIC INFORMATION**

**T  
E  
X  
T**

The images produced by the fluoroscopy system are imaged by a television system and displayed on a television monitor. Most systems use a 625-line television system (European standard) and a doubled interlaced raster scan. The monitor image is comprised of a series of television lines; alternate sets of lines being scanned in one pass, followed by the other set. In Europe the frame rate is 25 frames/second. The television monitor is a vacuum device in which a scanning electron beam traverses across a fluorescent screen. The current down this beam is related to the television signal. As the brightness on the monitor is proportional to the number and energy of the electrons incident on the phosphor at a point, the image corresponds to that at the television camera. It is important that the monitor is correctly adjusted and positioned, in low ambient light levels. On digital systems, the window width and window level controls may be adjusted to optimise the display for a particular imaging task.

AD  
C  
T

For extra information you can consult the following references. (ref)

K. Faulkner

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Technology Introduction to dedicated I. R. - X-ray equipment menu

Image systems  
TV Monitors

Lesson 30/80

Images  
 Video  
 History  
 Print Section  
 Objectives  
 Finder  
 Back

**ADVANCED INFORMATION**

**T** Television standards vary between countries, but in Europe, a television picture is usually comprised of 625 lines: The images produced by the fluoroscopy system are displayed on a television monitor. A television monitor is another type of vacuum device. An electron gun is used to create a scanning electron beam that is swept and focused onto the output phosphor of the television monitor. The latter is bonded onto the internal surface of the glass-viewing screen. Electrons are produced by thermionic emission, by heating a metal coil. These emitted electrons are focused in the electron gain. **(Image 1)**

**E** A series of electronic circuits move the scanning beams of the television camera and television monitor in synchronism. The current flowing in the scanning electron beam in the television monitor is related to that in the television camera. The brightness of the television monitor's viewing screen is proportional to the number and energy of the electrons incident on the phosphor at a point in the image corresponding position on the

**X** Basic Information

**C** The image displayed on the television monitor is comprised of a series of lines. These lines are scanned in a double interlaced pattern in which alternate sets of lines are scanned in each pass. A frame-rate of 25 frames/second is common throughout Europe.

It is possible to adjust the brightness and contrast settings on the

K. Faulkner

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Radiation Protection in Interventional Radiology menu

Radiation protection of the staff  
Influence of personal protection devices

reference

2- Wagner LK, Archer BR. **Minimising risks from fluoroscopic X-rays.** Third Edition. Radiation Management Partnership. The Woodlands, TX 77381. USA 2000.

3- Balter S. **Stray radiation in the cardiac Catheterisation Laboratory in 1998 Syllabus – Categorical Course in Diagnostic Radiology Physics: Cardiac Catherization imaging.** E. Nickoloff, K. Strauss. RSNA 1998.

4- Ross AM, Segal J, Borenstein D, Jenkins E, Cho S. **Prevalence of spinal disc disease among interventional cardiologists.** Am. J. cardiol 1997; 79: 68-70.

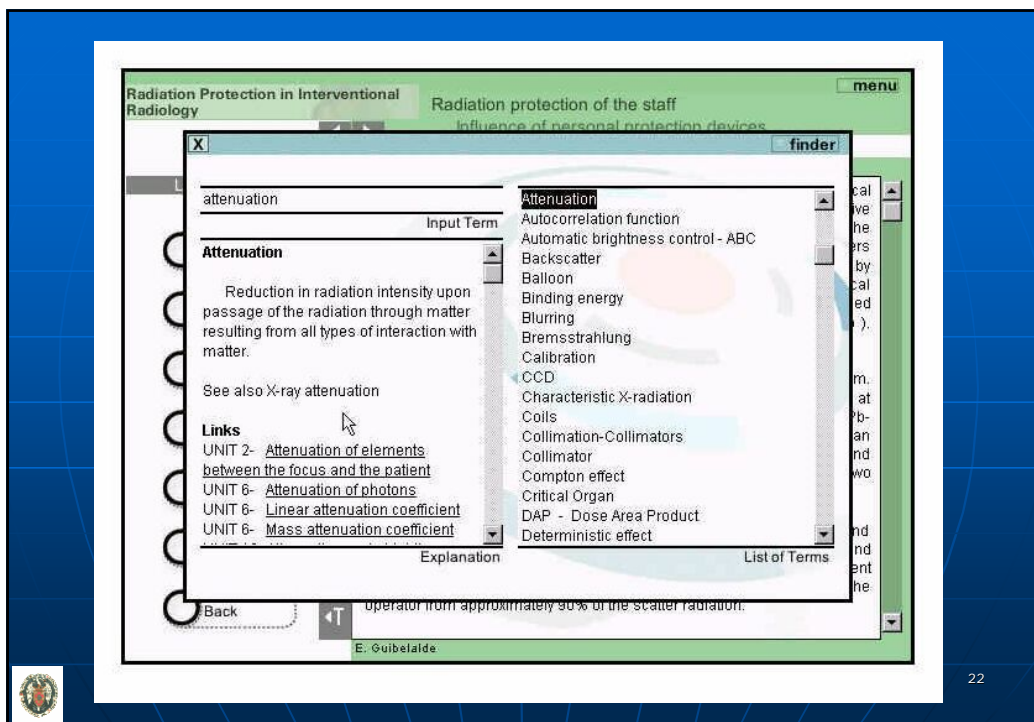
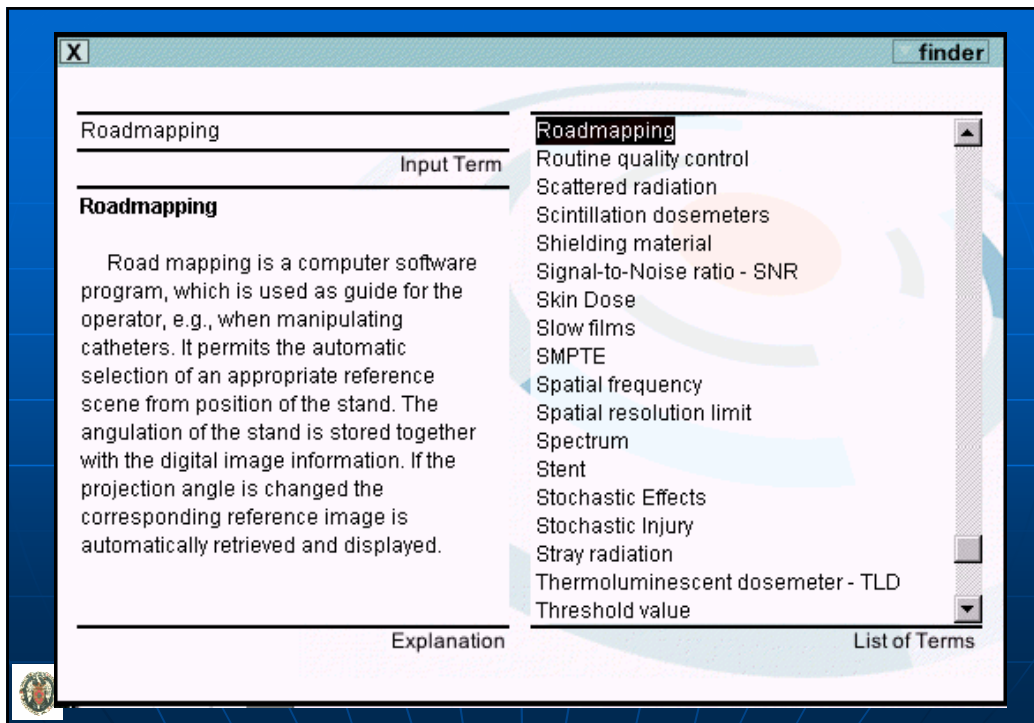
5- Kicken PJ, Bos AJ. **Effectiveness of lead aprons in vascular radiology: results of clinical measurements.** Radiology 1995; 197: 473-478.

Back

should be checked annually for holes, cracks or other forms of deterioration (ref 2)

E. Guibelalde

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Technology Introduction to dedicated I. R. - X-ray equipment C-arm movement

Lesson 24/80

IMAGES

- Images
- Video
- History
- Print Section
- Objectives
- Finder
- Back

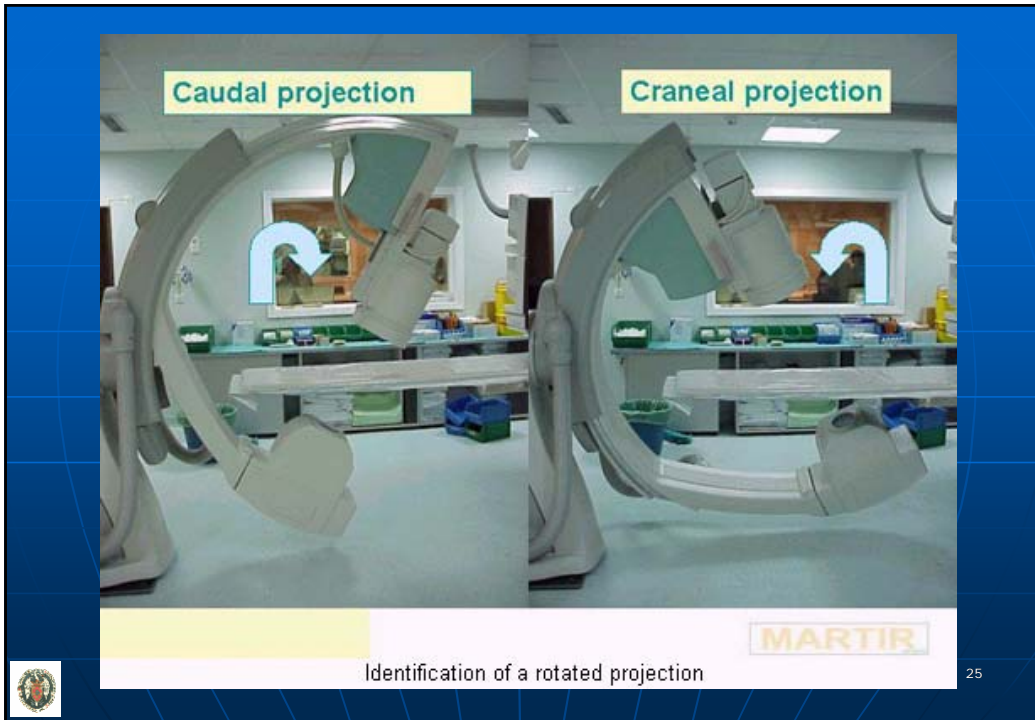
Normal patient position, specialist position and nurse position

J.J. Ten Image 1 / 4

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Normal patient position, specialist position and nurse position

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The student can follow the course completely at home including a final multiple choice test examination. The programme generates after that a printable certification with the total time dedicated to the training programme and the obtained score;

autoevaluation

### Autoevaluation

**Multiple choice accreditation exam fort Radiation Protection**

This exam contains **60 Multiple-Choice** questions in radiological protection in interventional radiology. These multiple choice questions should be answered by deciding true or false for each of the five items. Blank answers are not allowed. Marks are not deducted for incorrect responses in the examination. However, to pass the exam is necessary to answer correctly a **75 %** of the items. The exam must be completed in one single computing session.

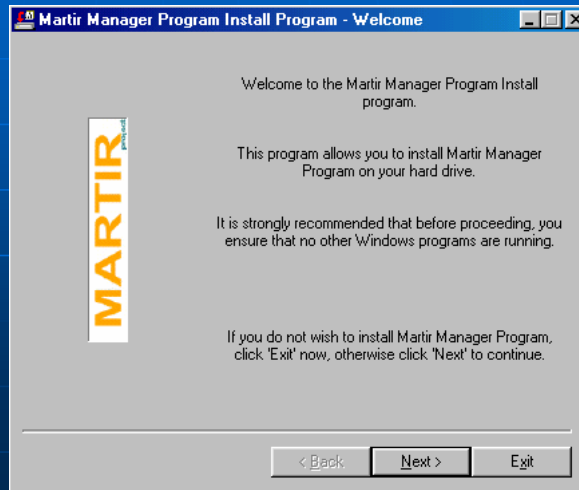
**WARNING:** You cannot save until 60 MC questions have been completed.

After finishing your exam you can obtain a print copy with your results. Depending on your country you can use this form for accreditation or for continuous training credits. No time limit.

Main Menu
START EVALUATION >

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By means of a small encrypted file (that is automatically saved at the student computer) the tutor is able to survey the dedicated time employed by the student for each chapter, how many times student has tried to pass each chapter, how many times has tried to pass the final test and detailed information of correct and wrong answers. Those encrypted files are only visible with a protected program also included in MARTIR CD.



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## MARTIR Manager Program Quick Reference





- The program of MARTIR user monitoring is a tool for consulting the learning process of the students and the performed evaluations.
- It also allows to print or to copy to your windows clipboard all the student's information for further uses. This option could be useful for possible accreditations.
- The program contains these sections:
  - User (It recognize the coded user files previously created)
  - Exam (It allows check the exam details of all users)
  - Options (It allows you to modify the entrance password)

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## Training manager programme:

User's Name **Vano Eliseo** Date of MARTIR First Use **17/04/01**  
 S.S.Course Last Visited Screen **FUNDAMENTALS OF...** User's Total Time **00.13.20**

Background Knowledge								
Date	Start	End	Section	MCQ	Correct	Fail	Time	Autoevaluations
17/04/01	06:33	06:41	General	5	3	2	00:03:07	
17/04/01	06:45	06:48	No Questions					
17/04/01	06:49	06:52	No Questions					

Open User   
 Exams   
 Options   
 Exit   
 Vano Eliseo






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## Training manager programme:

User's Name **Eliseo Vaño Galván** Date of MARTIR First Use **25/04/01**  
 S.S.Course Last Visited Screen **Step by Step Course Finished** User's Total Time **11.39.42**

Background Knowledge								
Date	Start	End	Section	MCQ	Correct	Fail	Time	Autoevaluations
25/04/01	0:55	1:31	General	5	3	2	00:11:50	
25/04/01	1:31	1:33	Fundamentals...	5	3	2	00:19:37	
25/04/01	1:33	2:54	No Questions					
25/04/01	3:36	3:56	Technology	5	3	2	00:16:29	
06/05/01	20:09	23:07	No Questions					
07/05/01	0:02	1:06	No Questions					
07/05/01	1:08	1:48	No Questions					
07/05/01	2:12	2:20	Radiation...	5	4	1	00:05:03	
07/05/01	2:26	2:31	No Questions					
07/05/01	14:17	14:54	No Questions					
07/05/01	21:51	22:58	No Questions					
08/05/01	23:35	0:39	No Questions					
08/05/01	1:07	1:08	No Questions					
08/05/01	2:02	3:20	Quality...	5	3	2	00:06:46	08.05.01
08/05/01	3:22	3:23	No Questions					





Open User   
 Exams   
 Options   
 Exit   
 Vano Eliseo




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User's Name **Eliseo Vañó Galván** Exam Date **08/05/01**

General Results		Section Results	
<b>PASS</b>		<b>General</b>	
294 Marks	98 % Correct Answers	22 Marks	88 % Correct Answers
Speciality Radiologist		Fundamentals of Radiation Physics and Introduction to Radiation Protection	
Elapsed Time 01:08:33		50 Marks	100 % Correct Answers
		Technology	
		73 Marks	97 % Correct Answers
		Radiation Protection in Interventional Radiology	
		100 Marks	100 % Correct Answers
		Quality Assurance in Interventional Radiology	
		49 Marks	98 % Correct Answers

Open User   
 Exams   
 Options   
 Exit 

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**MARTIR – Results after three years of use**

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- Students of the School of Medicine. The University Complutense of Madrid offers an optional subject on Radiation Protection for the students of Medicine during their 4th year. About 70 students follow this topic per year.
- Since 2002 more than 250 students follow the MARTIR CD at home as a complementary course.
- All of them used the CD at least during 40 hours, completed the intermediate level step-by-step course and pass the exam (score over 75% for 60 true-false multiple choice questions).
- Students have the opportunity of improving the qualification as many times as they wish by repeating the electronic exam.
- 87% of the students after finishing the course stated that this education methodology was very suitable for them.



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- Since 2002 more than 250 students follow the MARTIR CD at home as a complementary course.
- All of them used the CD at least during 40 hours, completed the intermediate level step-by-step course and pass the exam (score over 75% for 60 true-false multiple choice questions).
- Students have the opportunity of improving the qualification as many times as they wish by repeating the electronic exam.



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- As an example of result, it is interesting to point that MARTIR was followed together with a conventional course during the course 2004-2005 by 75 students at the Faculty of Medicine.
- Comparable marks with the electronic exam and with the conventional exam were obtained for 55 students and the qualification was undoubtedly assigned.
- The rest was required to repeat the MARTIR exam in presence of the tutor to confirm the assigned qualification (in this category were student with score 100%; student that fails the exam more than three times; student that finish the course in less than the average time or student with clear differences between the MARTIR electronic exam and the conventional exam)



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## CONCLUSIONS

**An effort must be done to encourage students of Medicine to follow training courses in Radiation Protection, particularly when basic courses of RP are not included in their curricula. MARTIR CD offers solutions to complement conventional Radiation Protection courses, e.g., for countries where no official accreditation is required, for training of fellows working in interventional labs while waiting for a regular course, for educational material for lecturers in regular courses, for continuous training programs, etc.**



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## CONCLUSIONS

If you want a free copy of MARTIR CD send me an  
e- mail at:

**[martir@med.ucm.es](mailto:martir@med.ucm.es)**



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