

Project MARR



Project MARR. Risk Matrix for Radiotherapy in Spain

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Risk in radiotherapy

- **Patient safety** is related to the risk derived from failures and mistakes in the therapeutic process

Report: "Radiotherapy Risk Profile" (WHO 2008)

Injuries	1723 patients	33 muertes (0,02%)
No harm	4349 incidents	

Must be part of Quality Management program

Accidents in radiotherapy

Irradiés d'Epinal: le chef de service de radiothérapie révoqué par Roselyne Bachelot

Publié le 6 mai 2008.

2 contributions

Recommander Soyez le premier de vos amis à recommander ça. Tweeter



Roselyne Bachelot, le 9 avril 2008 à Paris — BERTRAND GUYA/AFP

A Plus gros | Plus petit

SANTÉ - La ministre de la Santé Roselyne Bachelot a révoqué le chef de service de radiothérapie de l'hôpital Jean-Monnet...

MOTS-CLÉS

- Bachelot

La ministre de la Santé Roselyne Bachelot a révoqué le chef de service de radiothérapie de l'hôpital Jean-Monnet d'Epinal, où 5.500 personnes traitées par radiothérapie entre 1987 et 2006 auraient été victimes de sunirradiation, a indiqué

The New York Times

January 24, 2010

THE RADIATION BOOM

Radiation Offers New Cures, and Ways to Do Harm

December 28, 2010

A Pinpoint Beam Strays Invisibly, Harming Instead of Healing

By WALT BOGDANICH and KRISTINA REBELO

Radiation Mistakes: One State's Tally

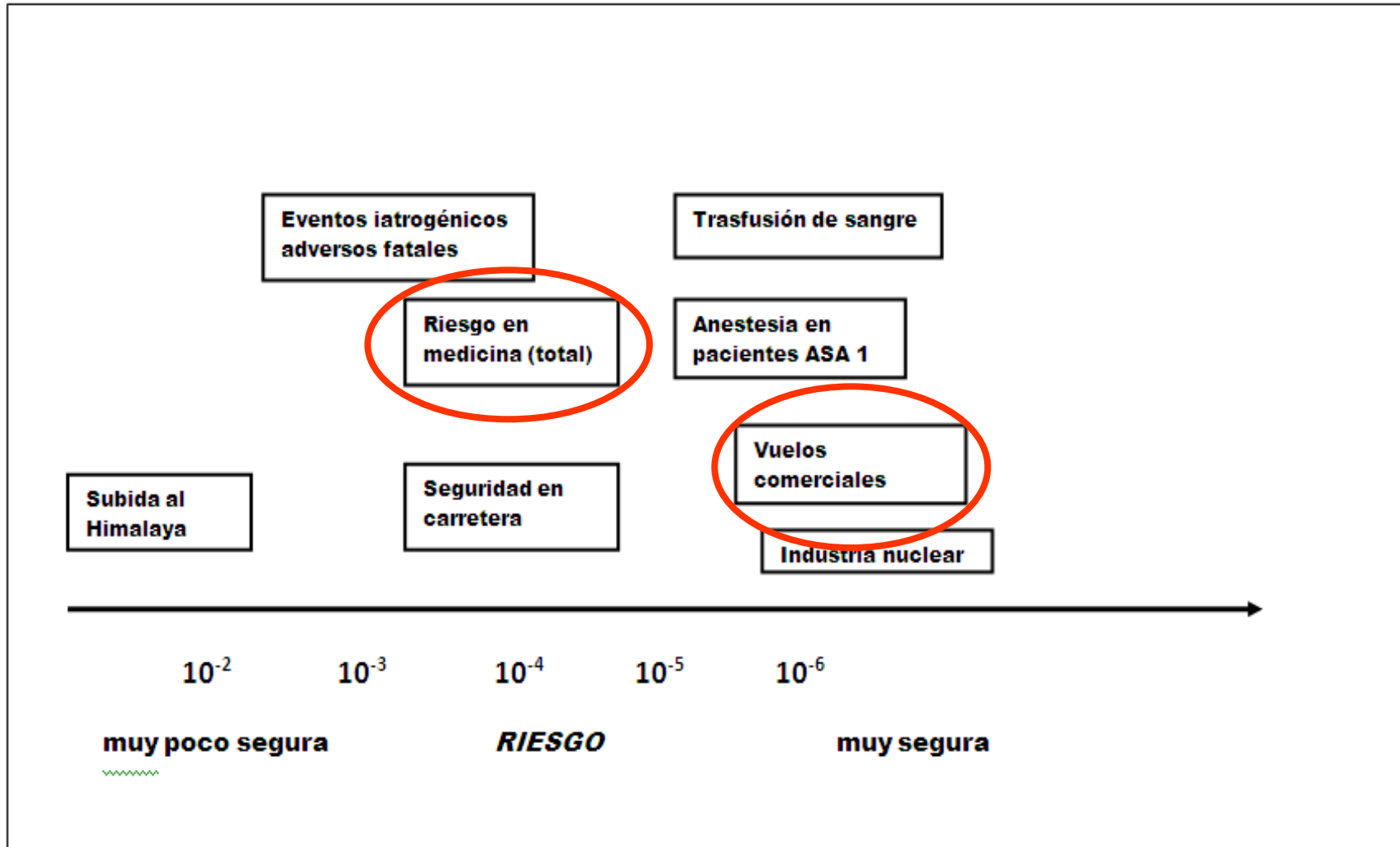
Even though New York State is the most stringent regulator of radioactive medical devices in the nation, many misadministrations of radiation go unreported there.

A New York Times analysis of state records showed 621 mistakes reported from January 2001 to January 2009. On average, there were about two contributing factors for each.

621 RADIATION MISTAKES

Missed all or part of intended target	Wrong dose given	Wrong patient treated
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Riesgo en radioterapia



IAEA-TECDOC-1670/S

Análisis Probabilista de Seguridad de Tratamientos de Radioterapia con Acelerador Lineal



IAEA-TECDOC-1685/S
COMPANION CD

APÉNDICES

Aplicación del método de la matriz de riesgo a la radioterapia



Agosto de 2012

Paper

PREVENTION OF ACCIDENTAL EXPOSURE IN RADIOTHERAPY: THE RISK MATRIX APPROACH

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Abstract Knowledge and lessons from past accidental exposures in radiotherapy are very helpful in finding safety provisions to prevent recurrence. Disseminating lessons is necessary but not sufficient. There may be additional latent risks for other accidental exposures, which have not been reported or have not occurred, but are possible and may occur in the future if not identified, analyzed, and prevented by safety provisions. Proactive methods are available for anticipating and quantifying risk from potential event sequences. In this work, proactive methods, successfully used in industry, have been adapted and used in radiotherapy. Risk matrix is a tool that can be used in individual hospitals to classify event sequences in levels of risk. As with any anticipative method, the risk matrix involves a systematic search for potential risks; that is, any situation that can cause an accidental exposure. The method contributes new insights: The application of the risk matrix approach has identified that another group of less catastrophic but still severe single-patient events may have a higher probability, resulting in higher risk. The use of the risk matrix approach for safety assessment in individual hospitals would provide an opportunity for self-evaluation and managing the safety measures that are most suitable to the hospital's own conditions.

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Key words: International Atomic Energy Agency; International Commission on Radiological Protection; radiotherapy; risk analysis

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INTRODUCTION

THE INTEREST in patient safety related to radiotherapy treatments is continuously increasing due to the ever-growing number of patients, facilities, and therapeutic indications. An additional challenge is posed by the complexity of new technologies and techniques, for which the traditional exhaustive lists of tests may no longer be feasible and “expert intuition” may no longer be as effective to perceive when something may be wrong, as it was with conventional radiotherapy. Lessons learned from published information on accidental exposures in radiotherapy are instrumental in ensuring that similar events become very unlikely in the future. Using lessons from past major events to improve radiotherapy safety is usually called the “retrospective or reactive approach.” Examples of such lessons are available, for instance, from ICRP (http://www.icrp.org/educational_area.asp) (2002) and IAEA (1998, 2000, 2001, 2003).

“Reactive approaches” may, however, not be sufficient, as new errors not foreseen from past lessons keep occurring (Pfeiffer et al. 2007). It is therefore necessary to obtain further information from more frequent types of errors that otherwise may go unreported. An important step in this direction has been taken by sharing “near misses” or events that did not have consequences for the patient but have the capacity to cause harm on another occasion or in another place. An example is given by the radiation oncology safety information system, ROSIS (www.clin.radiophys.lu/de/default.asp).

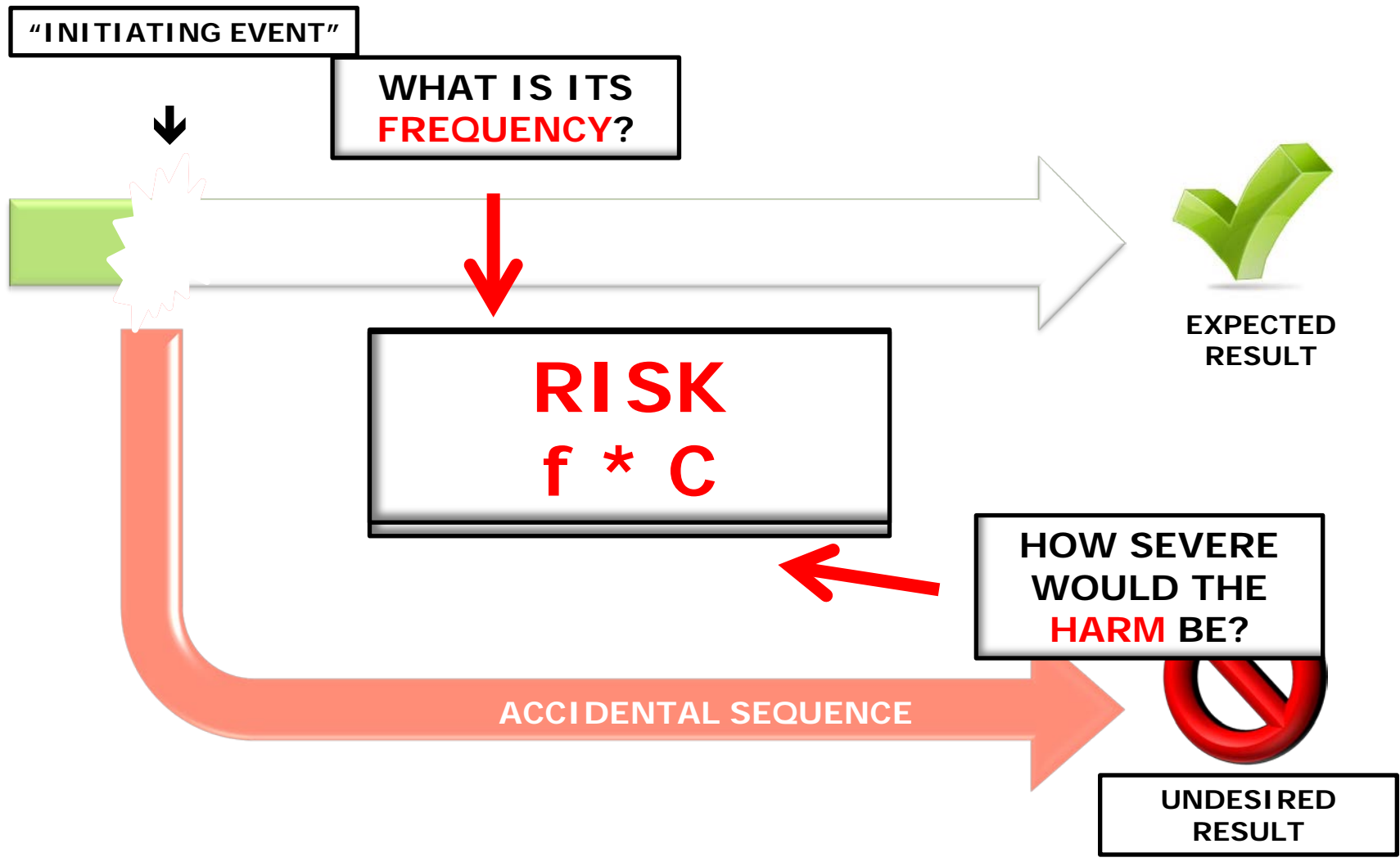
While sharing “near misses” is an important step, it still has the limitation of being confined to reported experience. Other latent risks may remain unaddressed unless the questions of “what else could go wrong?” or “what other hazards might be present?” are posed in a systematic, proactive manner. By doing so, one may be able to discover other potential errors that have not yet occurred or have not been shared. Methodologies

RISK MATRIX METHODOLOGY

"INITIATING EVENT"



RISK MATRIX METHODOLOGY

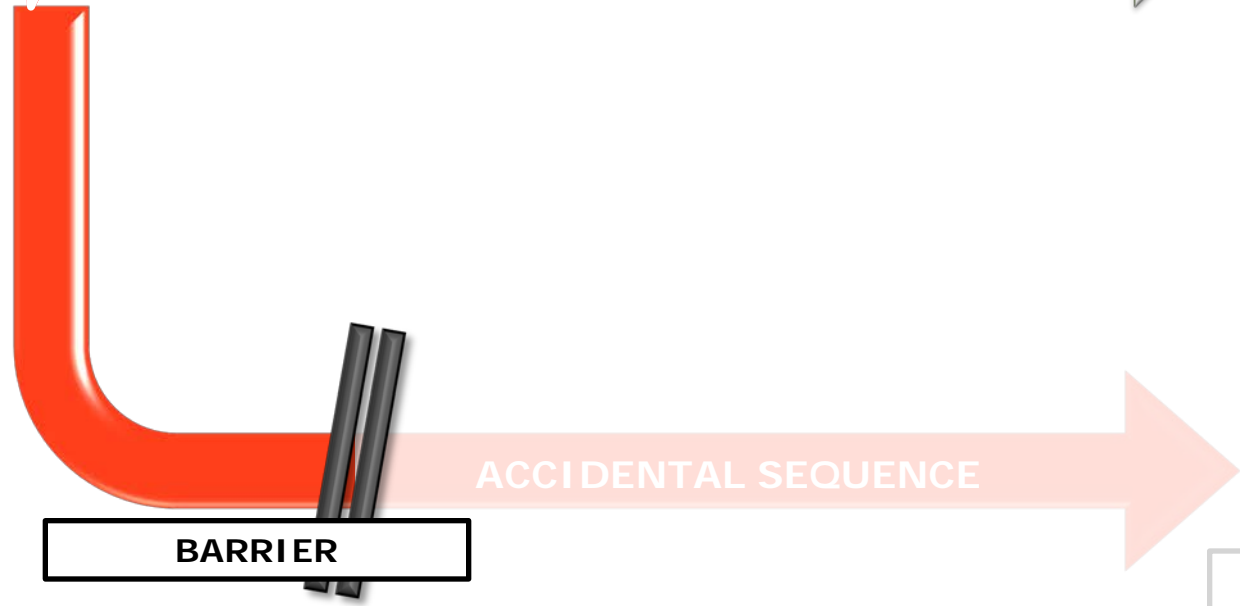


RISK MATRIX METHODOLOGY

INITIATING EVENT



EXPECTED RESULT

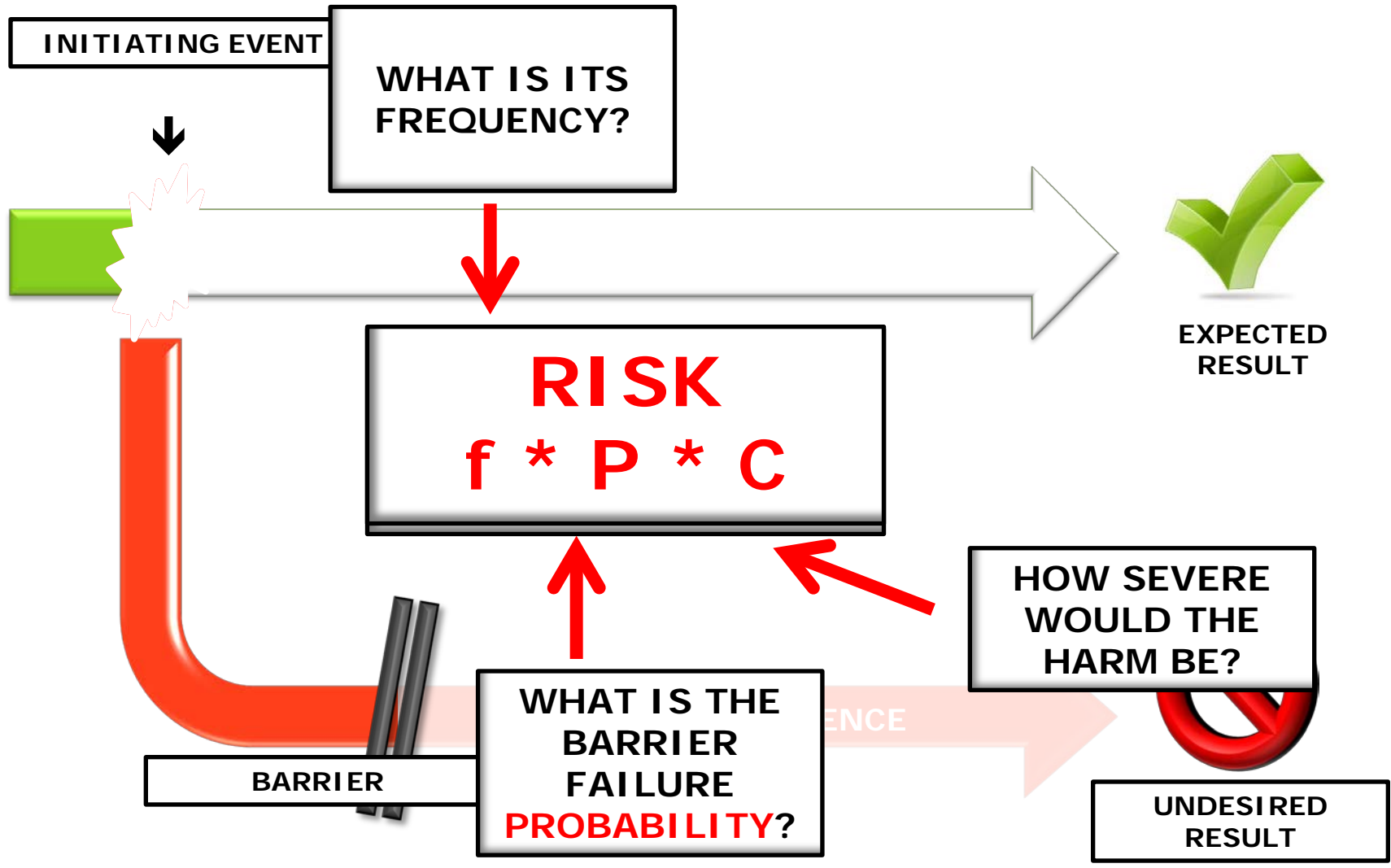


BARRIER

ACCIDENTAL SEQUENCE

UNDESIRABLE RESULT

RISK MATRIX METHODOLOGY



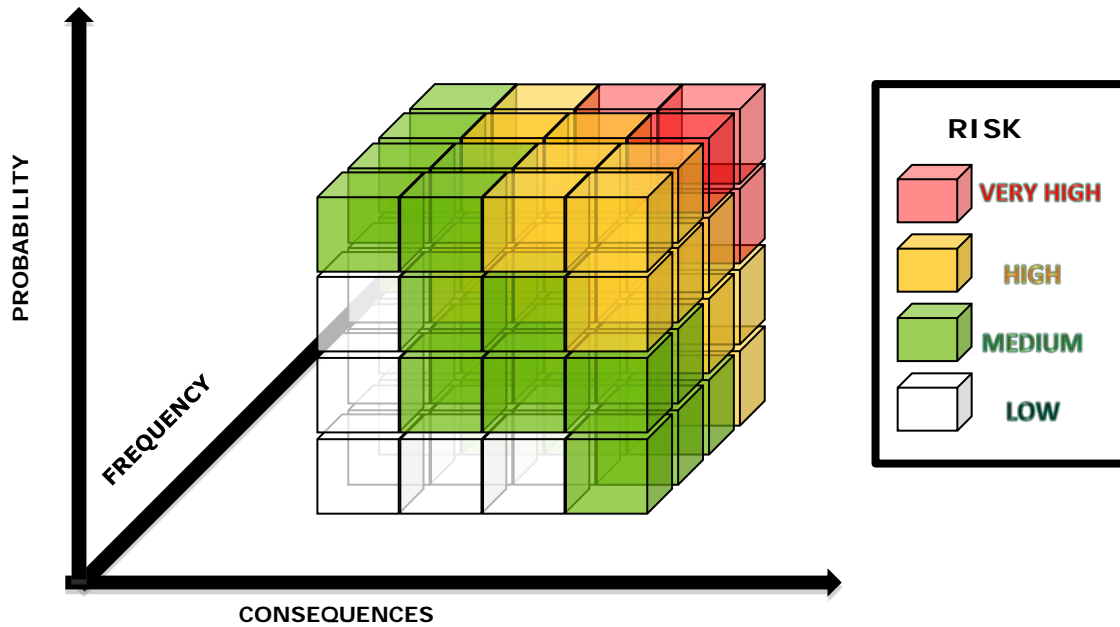
RISK MATRIX METHODOLOGY

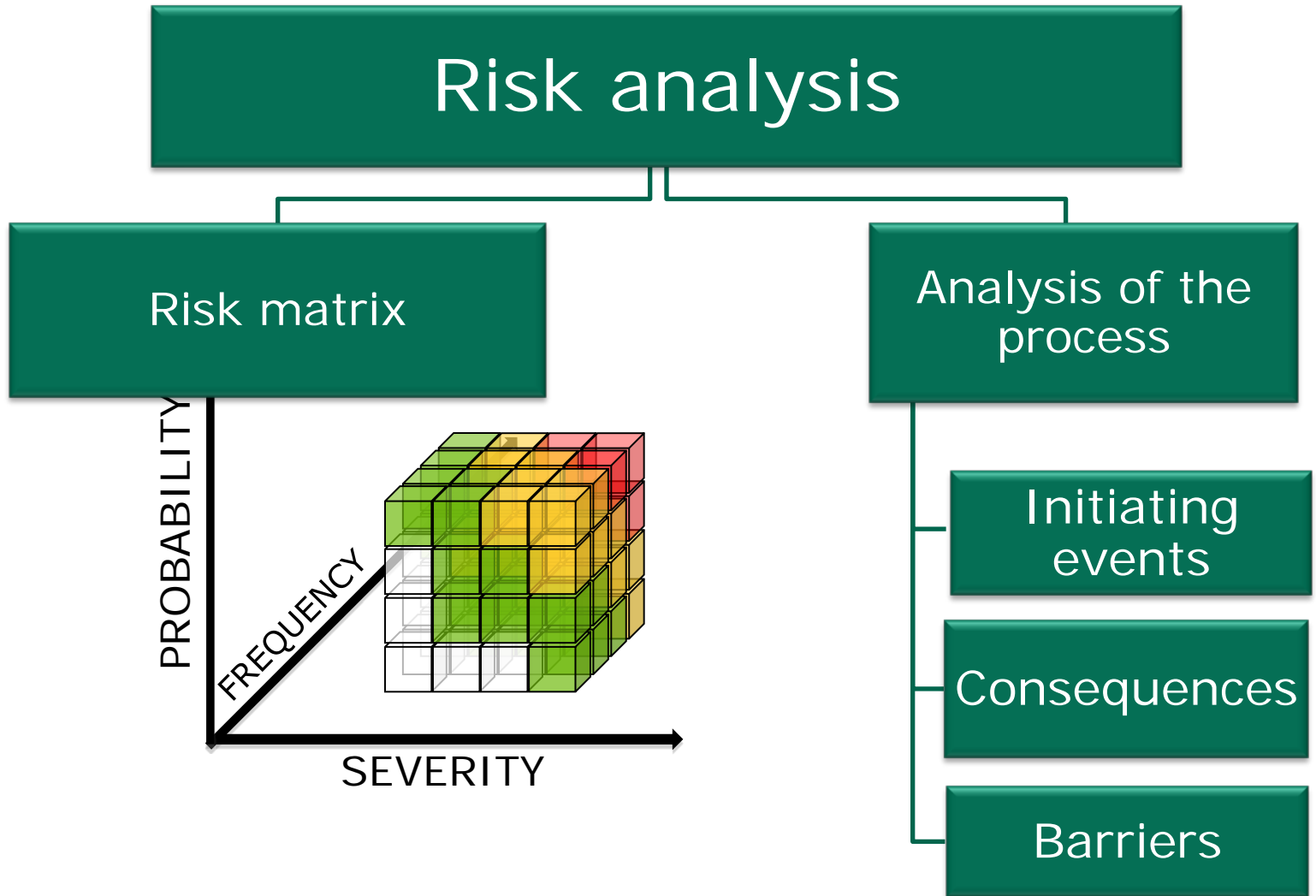
$$R = f \times P \times C$$

PH	CL	CM	CH	CVH	PL	CL	CM	CH	CVH
FH	RM	RH	RVH	RVH	FH	RL	RM	RH	RH
FM	RM	RH	RH	RVH	FM	RL	RM	RH	RH
FL	RM	RM	RH	RH	FL	RL	RM	RM	RM
FVL	RM	RM	RH	RH	FVL	RL	RM	RM	RM
PM	CL	CM	CH	CVH	PVL	CL	CM	CH	CVH
FH	RM	RH	RH	RVH	FH	RL	RM	RM	RH
FM	RM	RM	RH	RH	FM	RL	RM	RM	RM
FL	RL	RM	RH	RH	FL	RL	RL	RL	RM
FVL	RL	RM	RM	RH	FVL	RL	RL	RL	RM

RISK MATRIX

$$R = (f * P) * C$$

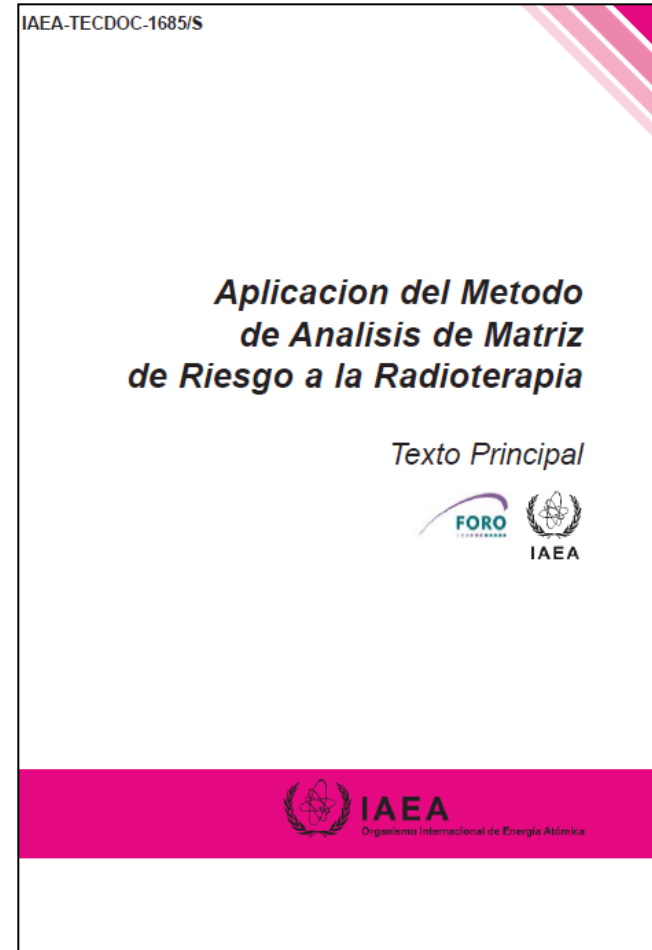




RISK MATRIX METHODOLOGY

ORIGINAL RISK MATRIX - RESULTS

INITIATING EVENTS	141	
Consequences on the patients	132	93.6 %
Consequences on the workers	5	3.5 %
Consequences on the public	4	2.8 %
Human Error related	111	78%
BARRIERS	100	
Risk Reducers	37	
Consequence reducers	26	
Very high risk sequences	0	0
High risk sequences	5	4%
Medium risk sequences	126	89%
Low risk sequences	10	7%



Project MARR: Risk Matrix in Radiotherapy (2013-2014)

OBJECTIVES

- **Training** of Hospital professionals in the Risk Matrix methodology applied to radiotherapy.
- **Pilot application** of the Risk Matrix methodology in significant radiotherapy services in Spain.
- **Development of guidelines** to help and guide the application of the methodology and its homogenization.
- **Guidelines** and methodology **diffusion**.

Project MARR: Risk Matrix in Radiotherapy (2013-2014)

PARTICIPANTS



Sociedad Española de Oncología Radioterápica
(Asunción Hervás Morón – H. Ramón y Cajal)



Sociedad Española de Física Médica
(José Miguel Delgado – Hospital 12 de Octubre)



Sociedad Española de Protección Radiológica
(Carlos Prieto – Hospital Clínico San Carlos)



Asociación Española de Técnicos de Radioterapia
(Pilar Crespo – Hospital 12 de Octubre)

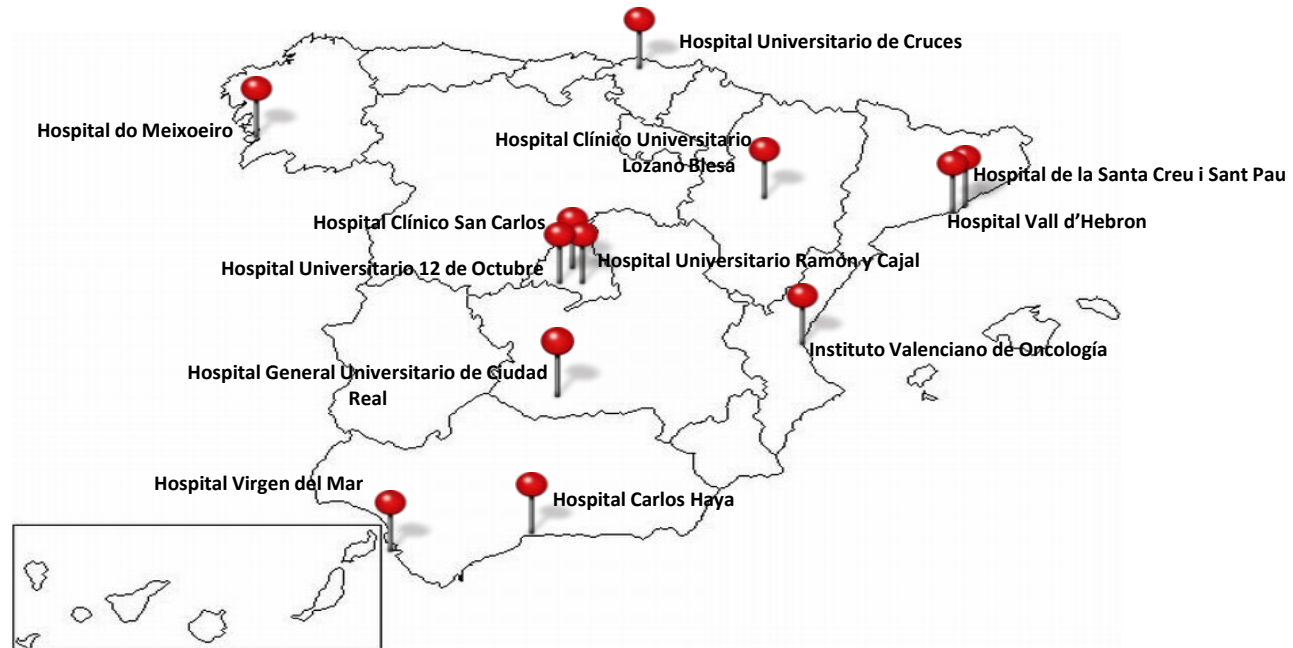


Consejo de Seguridad Nuclear
(IREM / SRO)

Project MARR: Risk Matrix in Radiotherapy (2013-2014)

PARTICIPANTS HOSPITALS (12)

- Each team comprised by, at least, a Radiotherapy Oncologist, a Medical Physicist and a Radiotherapy Technician



Project MARR: Stages (I)

- **Training:** May 2013, training seminar at Hospital Universitario Ramón y Cajal (40 attendees).
- **Pilot application:**
 - Analysis of radiotherapy services in the 12 hospitals according to a coordinated calendar using the Risk Matrix methodology and the SEVRRA site at CSN
 - Analysis of the results and of the comments by the coordinating group (Societies and CSN).
 - Response to the comments from all hospitals.
 - We have received more than 600 comments so far. Great deal of interest and high involvement from the participant hospitals.

Project MARR: Calendar

	JUNIO	JULIO	AGOSTO	SEPTIEMBRE	OCTUBRE	NOVIEMBRE	DICIEMBRE	ENERO	FEBRERO	MARZO
PRIMERA QUINCENA : Primer análisis con SEVRA	Inicio del TT° + Posicionamiento para TT° diario	Ejecución del TT°	Vacaciones	Vacaciones	Prescripción	Adquisición de datos anatómicos + Delineación de Volúmenes	Planificación + Elaboración de moldes	Navidad	Aceptación y puesta en servicio (Subetapa 1 del LINAC)	Aceptación y puesta en servicio (Subetapas 2, 3 y 4) + Mantenimiento
SEGUNDA QUINCENA : Segundo cribado + envío de comentarios							Navidad	Planificación + Elaboración de moldes		

Project MARR: SEVRRA web site

SEVRRA Detalle de la práctica registrada - Windows Internet Explorer

http://127.0.0.1:4001/riesgo/admon/registros/detalle.php?idregistro=1&idpractica=1&resumen=1

Práctica=> Acelerador Lineal 12 octubre

Ubicación=> Acelerador Lineal 12 octubre/Etapa 5/Suceso iniciador 3

Suceso Iniciador

Código:	AL-PAC5.3
Nombre:	Utilizar referencias erróneas para la realización de la TAC de Simulación.
Descripción:	
Descripción de la consecuencia:	

¿Aplica?

Si No

Riesgo

PMB FM CA = **RM**

Barreras y reductores seleccionados:

Barreras	Reductores de frecuencia	Reductores de consecuencia
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Delineación de volúmenes y órganos críticos en el sistema de planificación de tratamientos por parte del radiooncólogo, pudiendo detectar errores cometidos en las etapas previas, es decir en la de prescripción del tratamiento o en la toma de datos anatómicos. <input checked="" type="checkbox"/> Simulación del tratamiento, tanto si es virtual como real, lo cual permite detectar errores de geometría y posicionamiento del paciente. <input checked="" type="checkbox"/> Colocación e inmovilización del paciente en la posición de tratamiento para la sesión inicial, en presencia del radiooncólogo, el físico médico los técnicos de radioterapia <input checked="" type="checkbox"/> Imagen portal en la sesión inicial del tratamiento, a evaluar por el radiooncólogo, y el físico médico, con lo cual se detectan errores de geometría del tratamiento 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Existencia de protocolos para la realización del TAC <input checked="" type="checkbox"/> Mantener la carga de trabajo moderada 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Posicionado diario del paciente, en el cual los técnicos de radioterapia pueden detectar errores de geometría o de dosis por signos visuales (coloración de la piel, etc.)

Resumen de la práctica

Núm.	Etapa	Riesgo Muy Alto (RMA)	Riesgo Alto (RA)	Riesgo Medio (RM)	Riesgo Bajo (RB)	No Aplica (NA)	Registrados	Total por Etapa	Completo
1	Instalación inicial de los equipos	0	0	2	0	0	2	2	<input checked="" type="checkbox"/>
2	Aceptación y puesta en servicio	0	0	23	0	0	23	23	<input checked="" type="checkbox"/>
3	Mantenimiento de los equipos	0	0	3	0	0	3	3	<input checked="" type="checkbox"/>
4	Prescripción Clínica del tratamiento	0	0	5	1	0	6	6	<input checked="" type="checkbox"/>
5	Adquisición datos anatómicos del Paciente	0	1	5	3	0	9	9	<input checked="" type="checkbox"/>
6	Delineación de volúmenes	0	0	3	1	0	4	4	<input checked="" type="checkbox"/>
7	Planificación del Tratamiento	0	0	13	3	0	16	16	<input checked="" type="checkbox"/>
8	Elaboración de moldes	0	0	0	3	0	3	3	<input checked="" type="checkbox"/>
9	Inicio del Tratamiento	0	3	7	6	0	16	16	<input checked="" type="checkbox"/>
10	Posicionamiento para Tratamiento diario	0	1	11	2	0	14	14	<input checked="" type="checkbox"/>
11	Ejecución del tratamiento	0	0	37	3	0	40	40	<input checked="" type="checkbox"/>
Total		0	5	109	22	0	136	136	11

Gráfica

Práctica AL

RM 80%

RB 16%

RA 0%

Project MARR: Results analysis

	10.01	10.02	10.03	10.04	10.05	10.06	10.07	10.08	10.09	10.10	10.11	10.12	10.13	10.14	10.15
Acelerador Lineal	RA	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RA	RM	RA	RA
Acelerador Lineal	RA	RM	RM		RM	RM	RM	RM	RM	RM	RM	RA	RM	RM	RA
Acelerador Lineal	RA	RM	RM	RM	RM	RM	RM	RM		RM		RM	RM	RB	RM
Acelerador Lineal	RA	RM	RM		RM	RM	RM	RM	RM	RM	RM	RA	RM	RA	RA
Acelerador Lineal	RA	RM	RM		RM	RM	RM	RM	RM	RM		RA	RM	RM	RM
Acelerador Lineal		RM	RM		RA	RM	RM	RM	RM	RM	RM	RA	RA	RM	RA
Acelerador Lineal	RA	RM	RM		RM	RM	RM	RM	RM	RA	RM	RA	RM	RM	RA
Acelerador Lineal	RM	RM	RM	RM	RM	RM		RM	RM	RM		RA	RA	RB	RM
Acelerador Lineal	RA	RM	RM		RA	RM	RM	RM	RM	RA	RM	RA	RM	RA	RA
Acelerador Lineal	RA	RM	RM	RM	RM	RM	RM	RM	RM	RM		RA	RM	RA	RA
Siemens															
Elekta	RA	RM			RM	RM		RM	RM		RM	RA		RA	RA
Acelerador Lineal	RA	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RA	RM	RA	RA
Acelerador prueba	RA	RM	RM	RM	RM	RM	RM	RM	RM	RM	RM	RA	RM	RM	RA



Project MARR: Stages (II)

- **Methodology Guidelines:**

- Homogenization of the risk matrix, incorporating the suggestions of the participant Hospitals (11 new initiating events, 39 new barriers, modification of existing ones as a result of the comments ...).
- Practical how-to guide to apply the methodology.
- Analysis of difficulties encountered in the actual application, following the resolution of comments; estimated time and resources required, benefits ...

- **Diffusion of the Guide:**

- **Meeting** of participants, regulators and manufacturers, 4th quarter 2014, including Health Authorities.
- Diffusion in conferences, meetings, seminars. Societies and Hospitals are expected to also disseminate their experience with the project and the practical results of their analysis.