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Optimising work environments

Analysis of the risk factors related to ionizing radiation in a hospital environment: practical tool for the approved physician

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Idewe

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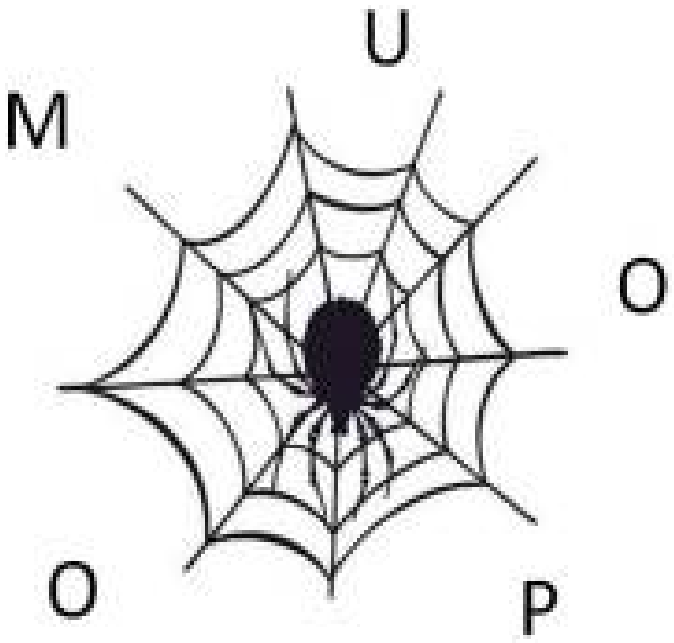
- Used model
- Practical use of the tool in nucleair medicine
- Advice

Scope of the analysis

- Systematic inventory of the risk factors related to ionising radiation
- Formulate preventive measures
  - Personal protective equipment
  - Training and instructions
  - Supervision
- Serve as a basis for further analysis

Used Model



Muopo

- Basis of Risk Analysis = analysis of conditions

  M= Mens = human

  U= Uitrusting = equipment

  O= Omgeving = environment

  P= Product

  O= Organisatie = organisation

Cooperation Idewe – University Hospital Ghent

ANALYSE VAN DE RISICOFACTOREN VOOR BLOOTSTELLING AAN IONISERENDE STRALING

idewe
Optimising work environments

UZ Universitair Ziekenhuis Gent

Sector:				**Uitvoerders:**
Dienst:				
Locatie:				**Datum:**

MENS (HUMAN)

1.1. knowledge of procedures and guidelines

	ID	Factor	<-- Input field Score	Importance (1 - 3)	Result	Explanation
1. Mens/Human	1.1	**Knowledge of procedures and guidelines (all staff):** **Score 0: Known, always applied, regularly supervision of the work method / not applicable** **Score 1: Known, always applied** **Score 3: Known** **Score 5: Not known**				
	1.1.1	The icons related to ionizing radioation and the designation of the controlled area		1	0	
	1.1.2	General precautions when entering the controlled area		2	0	
	1.1.3	Work instructions for working with ionizing radiation		3	0	
	1.1.4	Guidelines on the use of personal dosimeters		1	0	
	1.1.5	Guidelines on the use of existing personal protective equipment		3	0	
	1.1.6	Procedures in calamities (contamination, radiation, spill)		3	0	
	1.1.7	Procedures for disposal of radioactive waste		3	0	
	1.1.8	Procedures for handling of radioactive patient samples		3	0	

MENS (HUMAN)

1.2. incidence of actions or events

1.2	Incidence of actions and events Score 0: Never Score 1: Occasionaly Score 3: Regularly Score 5: Always				
1.2.1	One of the following operations are carried out on the service: CT-scan or X-Ray,injection of isotope, administering radiation therapy		2	0	
1.2.2	Staff of the service operate the machine or inject isotopes themselves		3	0	
1.2.3	Staff of the service assist applications with ionising radiation (eg fixation of the patiënt)		1	0	
1.2.4	Employees enter a controlled area outside their own service		2	0	
1.2.5	While taking an X-Ray by members of the mobil team, staff are always close to the patiënt (<2m)		2	0	
			Totaal	0,00	

UITRUSTING (Equipment)

2. Uitrusting	2.1	**Presence and use of material:** **Score 0:** Always present and used / Not applicable **Score 1:** Always present but not always used **Score 3:** Sometimes not present **Score 5: Not present**				
	2.1.1	Lead apron		3	0	
	2.1.2	Thyroid Protection		3	0	
	2.1.3	Lead glasses		3	0	
	2.1.4	Gloves		3	0	
	2.1.5	Lead screen		3	0	
	2.1.6	Dosimeter		1	0	
	2.1.7	GM-tube / GM-counter		1	0	
				Totaal	**0,00**	

Omgeving (Environment)

3. Omgeving	4.1	**Incidence of actions and events:** **Score 0:** Never **Score 1: Occasionally** **Score 3:** Regularly **Score 5:** Always				
	4.1.1	Risk for external stimuli whereby the routine operation is disturbed		2	0	
	4.1.2	The service also functions as a training center: precence of students and trainees		3	0	
				Totaal	**0,00**	

Product (Used Application)

4. Product	3.1	Used application				
		- **Score 0:** Ni-63 spectrometer - **Score 1:** RX-toestel < 100keV - **Score 3:** RX-toestel > 100keV, CT-Scan - **Score 5:** Lineaire versneller, Isotopen (I-131, Ir-192, ...)		3	0	
				Totaal	**0,00**	

Organisatie (Organisation)

5. Organisation	5.1	**Presence and evaluation of procedures and guidelines** **Score 0:** Present, implemented and regulary evaluated / Not applicable **Score 1:** Present and implemented, not or rarely evaluated **Score 3:** Present but not always implemented **Score 5:** Not present				
	5.1.1	Working instructions		3	0	
	5.1.2	Procedure thad describes the application of the ALARA-principle		3	0	
	5.1.3	Procedure for delivery of radioactive materials		3	0	
	5.1.4	Training policy (art. 25)		2	0	
	5.1.5	Aangestelde van bewaking		3	0	
	5.1.6	Procedures concerning the presence of students and trainees in controlled areas		3	0	
	5.1.7	Policies related to the maintenance, inspection and replacement of personal protective equipment		3	0	
				Totaal	**0,00**	

Practical use of the tool in nuclear medicine service

- Participants: internal prevention counsellor, head of the service, occupational physician radioprotectionist
- Question by question
- Discussion of the results with health physicist
- Presentation for Committee

Results nuclear medicine service

	ID	Factor	Score	Importance (1 - 3)	Result	Explanation
1. Mens/Human	1.1	Knowledge of procedures and guidelines (all staff): Score 0: Known, always applied, regularly supervision of the work method / not applicable Score 1: Known, always applied Score 3: Known Score 5: Not known				
	1.1.1	The icons related to ionizing radioation and the designation of the controlled area	0	1	0	
	1.1.2	General precautions when entering the controlled area	0	2	0	
	1.1.3	Work instructions for working with ionizing radiation	0	3	0	
	1.1.4	Guidelines on the use of personal dosimeters	0	1	0	
	1.1.5	Guidelines on the use of existing personal protective equipment	0	3	0	Use of gloves. The isotope is shielded by lead at the source (eg.syringe holder, lead container, lead screen), or by shielding in the walls
	1.1.6	Procedures in calamities (contamination, radiation, spill)	0	3	0	door aangestelde van bewaking
	1.1.7	Procedures for disposal of radioactive waste	0	3	0	
	1.1.8	Procedures for handling of radioactive patient samples	0	3	0	in hotlab

1.1.6	Procedures in calamities (contamination, radiation, spill)

6. Richtlijnen bij radioprotectieve incidenten

6.1. Principes :

In alle gevallen moet onmiddellijk de eenheid TL worden verwittigd, die zijn instructies zal geven en de interventie zal uitvoeren of toezicht zal houden op de interventie.
De interventie moet er in eerste instantie op gericht zijn de verspreiding van de besmetting te beperken. Door uitwendige besmetting te voorkomen tracht men inwendige besmetting te vermijden.
Materiaal dat gecontamineerd is, moet buiten gebruik worden gesteld tot men onder het stralingsniveau zit. (bedlinnen, spuitenhulzen stockeren tot voldoende verval, enz...). Zie ook procedure voor verwijdering van radioactief afval DNG.TL.WPR.7

6.2. Besmettingsnormen :

Voor verschillende radionucliden bestaan er verschillende maximale besmettingsnormen. Deze besmettingsnorm kan gevonden worden onder "Derived limits, Removable contamination" van de desbetreffende radionuclide-fiche. Deze fiches worden bewaard in map DNG.KB.MAP.4.

Het besmettingsniveau kan gemeten worden met DNGLA007/DNGLA008. Deze toestellen werden gecalibreerd zodat gekend is welke uitlezing (in cps) overeenkomt met de besmettingsnorm. Calibratiedata worden vermeld in tabel I en zijn ook aangebracht op het meettoestel.

Wanneer het besmettingsniveau 10 maal de norm overschrijdt, spreekt men van een incident. Dit is dus een ernstige besmetting. Incidenten worden via een IKA aangemeld en opgevolgd. Bovendien moet in geval van een ernstige besmetting iemand van de eenheid TL aanwezig zijn bij de decontaminatie-procedure.

Results nuclear medicine service

	1.2	**Incidence of actions and events** **Score 0: Never** **Score 1: Occasionaly** **Score 3:** Regularly **Score 5:** Always				
	1.2.1	One of the following operations are carried out on the service: CT-scan or X-Ray,injection of isotope, administering radiation therapy	5	2	10	
	1.2.2	Staff of the service operate the machine or inject isotopes themselves	5	3	15	
	1.2.3	Staff of the service assist applications with ionising radiation (eg fixation of the patiënt)	5	1	5	
	1.2.4	Employees enter a controlled area outside their own service	3	2	6	yes
	1.2.5	While taking an X-Ray by members of the mobil team, staff are always close to the patiënt (<2m)	0	2	0	not applicable
				Totaal	**2,77**	

Results nuclear medicine service

2. Uitrusting	**2.1**	**Presence and use of material:** **Score 0:** Always present and used / Not applicable **Score 1:** Always present but not always used **Score 3:** Sometimes not present **Score 5: Not present**				
	2.1.1	Lead apron	1	3	3	
	2.1.2	Thyroid Protection	5	3	15	
	2.1.3	Lead glasses	5	3	15	
	2.1.4	Gloves	0	3	0	
	2.1.5	Lead screen	0	3	0	
	2.1.6	Dosimeter	0	1	0	
	2.1.7	GM-tube / GM-counter	0	1	0	
				Totaal	**4,71**	

Results nuclear medicine service

3. Omgeving	4.1	**Incidence of actions and events:** **Score 0:** Never **Score 1: Occasionally** **Score 3:** Regularly **Score 5:** Always				
	4.1.1	Risk for external stimuli whereby the routine operation is disturbed	3	2	6	patients are often children / confused neurological patiënts
	4.1.2	The service also functions as a training center: precence of students and trainees	5	3	15	new trainees are trained in radioprotection before they start working in this service
				Totaal	**10,50**	

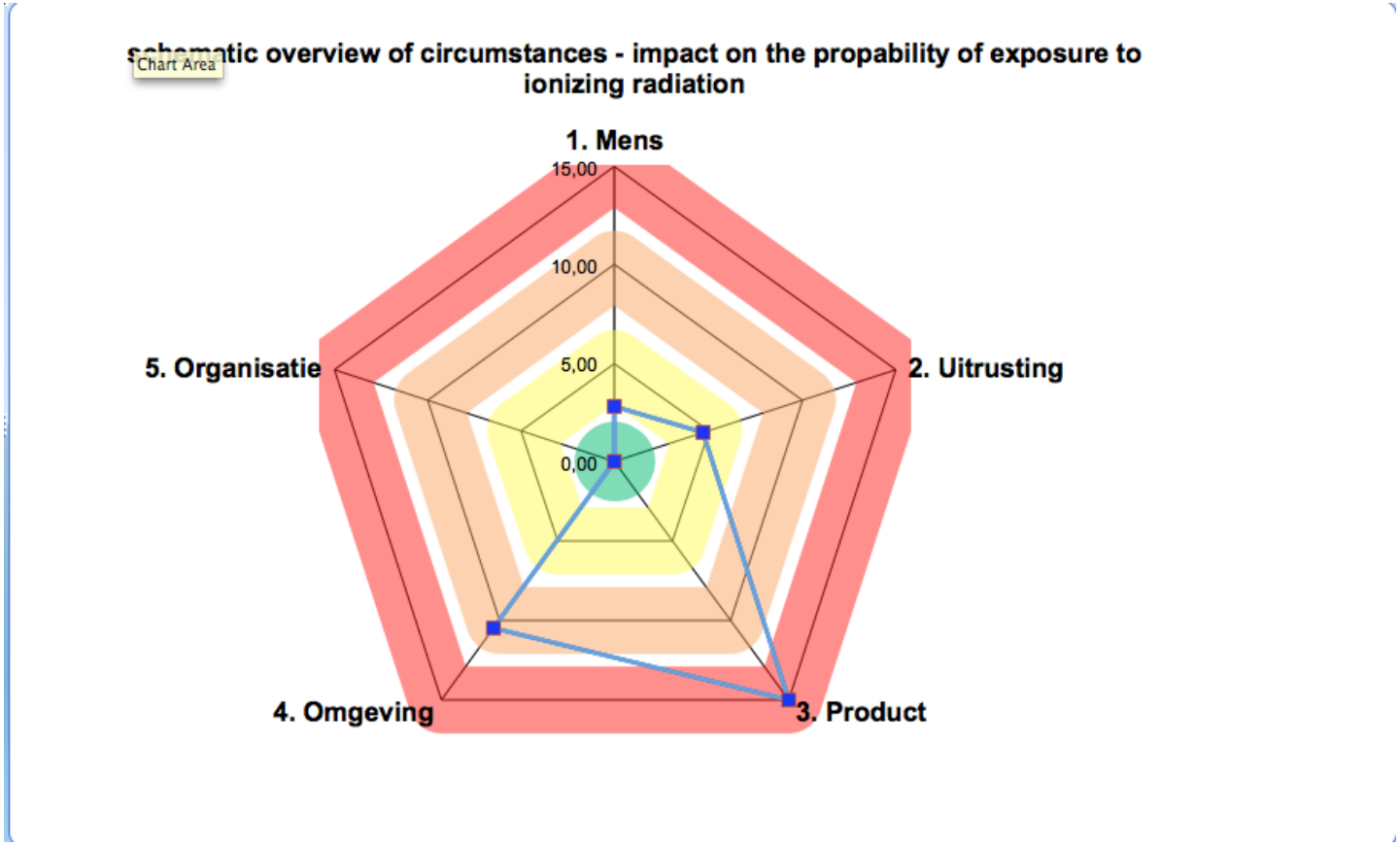
Results nuclear medicine service

4. Product	3.1	Used application				
		- **Score 0:** Ni-63 spectrometer - **Score 1:** RX-toestel < 100keV - **Score 3:** RX-toestel > 100keV, CT-Scan - **Score 5:** Lineaire versneller, Isotopen (I-131, Ir-192, ...)	5	3	15	
				Totaal	**15,00**	

Results nuclear medicine service

5. Organisation	5.1	**Presence and evaluation of procedures and guidelines** **Score 0:** Present, implemented and regulary evaluated / Not applicable **Score 1:** Present and implemented, not or rarely evaluated **Score 3:** Present but not always implemented **Score 5:** Not present				
	5.1.1	Working instructions	0	0	0	
	5.1.2	Procedure thad describes the application of the ALARA-principle	0		0	
	5.1.3	Procedure for delivery of radioactive materials	0	3	0	
	5.1.4	Training policy (art. 25)	0	2	0	
	5.1.5	Safety supervisor	0	3	0	
	5.1.6	Procedures concerning the presence of students and trainees in controlled areas	0	3	0	
	5.1.7	Policies related to the maintenance, inspection and replacement of personal protective equipment	0	3	0	
				Totaal	**0,00**	

Overview



Scores

Risico	Kans	Groene ring	Gele ring	Oranje ring	Rode ring
1. Mens (Human)	2,77	0,10	5	10	15
2. Uitrusting (Equipment)	4,71	0,10	5	10	15
3. Product	15,00	0,10	5	10	15
4. Omgeving (Environment)	10,50	0,10	5	10	15
5. Organisatie (Organisation)	0,00	0,10	5	10	15
Totaal:	6,60				

Recommendations

$R \leq 2$	Requires attention
$2 < R \leq 6$	Measures required
$R \geq 9$	Immediate measures required

Recommendations

- ‘Product’ can not be avoided
  - Procedures handling isotopes are available and well known
  - Procedures concerning incidents are available and well known
  - Weekly meetings are provided with staff

Recommendations

- ‘Environment’
  - Trainees are trained in radiotionprotection before they start working in the service
  - Children can not be avoided: staff is trained to work with children

Recommendations

- Equipment
  - Regular meetings to discuss used equipment
  - The use of lead glasses and thyroid protection is not recommended because of the high energy of the isotopes / the work in the hot-lab is well controlled: leadglass, protected vials, protected syringes

Conclusions

- Instrument to analyse the risk factors that contribute to exposure to ionising radiation in a systematic way
- Not fit for deep risk analysis of exposure
- Can function as a good base for further analysis

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