Applying Radiation Protection Issues to Hospitals Radiological Emergency Preparedness

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Abstract

Updating Hospitals emergency preparedness to Radiological Emergency situations was an opportunity to reevaluate key issues: What is the main threat - Nuclear or Radiological? RDD or industrial? As a result of such a discussion-what kind of radiation monitors to select? Should they be similar to those other emergency organizations use? What Personal Protective Equipment (PPE) level to decide on? Who are hospital emergency team members and how deep is there radiation protection knowledge? How and where to train them? Are drills needed? How often so normal hospital activity is not disturbed? What kind of manuals to prepare?
This paper describes the process that led to the change of policy from preparedness to nuclear accidents only, to all kind of radiological emergencies with an emphasis on radiological terror. Supply of new radiation and contamination detection equipment took place, same as the one that other emergency teams have. A new and simple level C PPE applied. Training set different team members on same level. Several manuals prepared: How to prepare Hospital to contaminated casualties in order to minimize normal routine – in case there is an information on contaminated casualties on the way and in case it was discovered after they arrived, how to treat a contaminated casualty, to decontaminate him or not? How to decide that a casualty is contaminated or not? What to do with casualties belongings? What to do with contaminated equipment? How to exit a contaminated zone? How to set hospital back to ordinary work? etc.

Keywords: Radiological, Emergency, Hospitals ,Preparedness.

1. Introduction

Preparedness to nuclear emergencies (not to nuclear attack), including of hospitals, is a common practice for a country using nuclear installations. In order to check 1990's procedures validity, a new committee established in the beginning of the new millennium. A radiation protection and l radiological emergency preparedness expert was one of the members of the new committee. It was an opportunity to point out the need to be prepared also to "simple" radiological emergencies (industrial, transportation, etc.) and to the old/new threat of radiological terror that is emerging. Medical procedures were updated too, but they are out the scope of this paper.

2. Threat and Scenario

a) Threat: We reevaluated the real radiological risk to hospital first receivers as a result of treating casualties of nuclear accidents. Then we screened several real radiological accidents and incidents and evaluated the risk and possibilities to occur. Next step was radiological terror possibility assessment and its radiological risk to hospital crew. Last step was the decision that main focus should be on radiological terror and that proper resources and preparedness to it are suitable to other radiological emergencies too, including accidents.

b) Scenarios: Usual scenarios are "noisy" and "quiet", which refer to explosion of Radiation Dispersal Device (RDD) or to Radiation Emitting Device (RED). Table 1 presents my recommendation to look at the different possibilities as combination of them:

Table 1: RDD/RED Scenario options

	Noisy	Quiet
Noisy	1)Was aterror explosion or an accident and there is knowledge it included radioactive material=RDD or industrial/hospital accident	2)Was a terror explosion but no idea it included radioactive material.
Quiet	3) Same as 2	4)No knowledge = RED

3. Radiation monitoring equipment

Third issue was radiation monitoring equipment? We divided it into four sub issues:
a) What kind of equipment was is in use?
b) How many systems in each hospital and is the number comply with the needs?
c) What were monitors operation procedures and should they be improved?
d) Dosimeters.

a) Obviously the answer to this point was easy. The equipment was a design and production of early 90's and did not comply with modern standards. But each system consisted of three parts: A gamma radiation Geiger counter, a beta pancake probe that could be attached to the Geiger counter, and an alpha proportional probe, also attached to the Geiger. Attaching probes to the counter, automatically changed it into a monitor of the probe.
We recommended replacement of old radiation monitoring equipment with a new one, still each system should be consisted of same three units. The system is the same as other emergency organizations use. This way communication an coordination is easyer.
b) Old recommendations were for three monitoring system for each hospital. Reevaluation of possible casualties flow concluded as recommendation for eight systems in each hospital.
c) As described in para.2, first receivers may have or have no idea on radioactive materials involvement in the attack. So we decided to prepare for them a detailed two sided card how to act in each scenario, including action levels. Since we realized the threat might be greater from contamination rather from point radiation source, and in order to simplify the operation, we ordered the use of two detectors only instead of three, see Table 2:

Table 2: Inspectors Working Card

Side 1

Working card for Hospital Radiation Inspector in case of Radiological Emergency

(Comment: Each instrument type have to have its typical card)

This card is given to hospital radiation inspector in order to provide him with the counts levels that differentiate contaminated persons, clothing or equipment from not contaminated.

You should pay attention to unit differences.

Decontamination post inspectors have different orders!!

The reason this card has different options, is because there may be no knowledge on the type of the radioactive material.

For Decontamination post inspectors:
In case you do not know radioactive material type, do not declare any person as "clean", but after checking him with the two detectors and you measured smaller levels then in tables 2 and 3.

No person, casualty or not, and no clothing or equipment may be released, but after being checked by the two detectors and values measured are smaller then in tables 2 and 3!!!

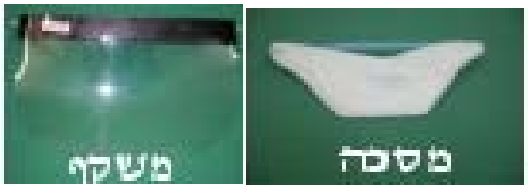
First step: Attach pancake detector to counter						
	Only below this counts levels you may declare "contamination free" (cpm/cps)					
	Equipment	Clothing	Rest of body skin	Hands skin	**Radioactive Material**	
Detector type				(**)	Not known (1 May be mix of (2 different radiations emitters Gamma and Beta (3 emitters	Table 1
Same detector					Only Beta emmiters	Table 2
Change detector						
Alfa detector type					Alpha sources only	Table 3

d) Dosimeters: Each hospital had pen dosimeters for each emergency crew. We recommended the supply of modern but simple to use electronic dosimeters.

4. Personal Protective Equipment (PPE)

Old PPE included cotton overall and boots, plastic boots (Photo1), two pairs of gloves and NBC mask. Evaluating real risk and maneuverability of the crew, we replaced it with PPE that hospital first receivers are familiar with, such as of SARS emergencies or from routine usage in hospital. Beside one piece coverall (Photo 2) we supplied two boots pairs, one under the coverall and one above it, same two pairs of gloves, N95 respiration mask and visor. Beside we updated dressing and undressing procedures and created procedure of establishment of intermediate undressing post between contaminated area and clean area. (Figure 1)

Photo2 Photo 1



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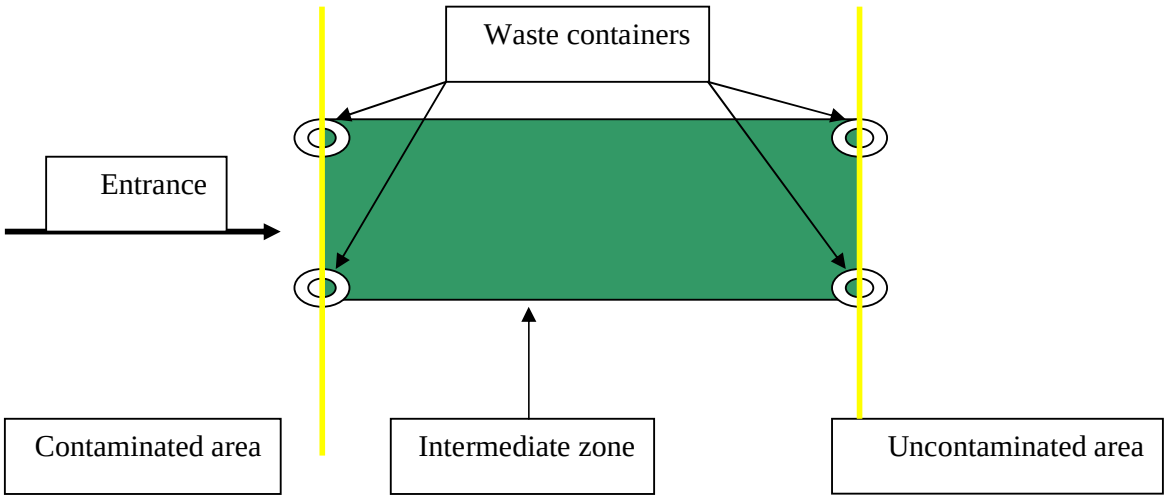
(**) Each user may use the relevant values according to instrumentation at hand.

Figure 1



5. Drills and Training

Regarding radiological emergencies, we found two groups of hospital first receivers. One consists of medical stuff used to emergencies, either because terror attacks or other emergencies. Second group are the radiation inspectors, most of them x-ray and CT machines operators, with small idea about radioactive materials and emergencies. After some trial and error trainings, we concluded that prior to drills we will conduct separate refresher training. In addition, every two years we will train inspectors in a specific course. This is being done for two days out of the hospital and includes basics of radiation protection, full PPE and real radioactive materials search and measure.

6. Manuals

One of the committee members edited and arranged a complete book of Hospital Radiological Emergency Preparedness. Most of it contains medical aspects but some parts contain radiation protection issues, beside those mentioned earlier. They include:
a) Manual for hospital Radiation Protection Officer (RSO). Hospital RSO is the person that should look for hospital radiological preparedness, including radiation monitors calibration and maintenance and availability of all other equipment. In case of emergency he should see that all inspectors work the correct way and control logistics. For example – that there are enough radioactive waste containers, and that people use them only for radioactive waste and they are is a separate isolated and controlled area.
b) Manual and format for the collection of patient's personal belongings.
c) Manual how to behave with corps that may have been contaminated, and more.

7. Summery

Coordination between medical stuff and radiation protection people is highly recommended wile preparing for radiological emergencies.

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