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Database Structure for Radiation Incidents and for Treatment of Affected People

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ABSTRACT. This article describes an effort to create a national database of radiation incidents in Bulgaria. It is intended for use by National Center for Radiobiology and Radiation Protection (NCRRP). The purpose of the database is to store specific description of the radiation incident and to trace the health effect on people who participated in the incident. We show also data from the recent radiation incident in Sliven stored in our database.

1. Introduction

Technologies that make use of ionizing radiations are widespread. These technologies provide many benefits but the use of ionizing radiations carries with it the potential for radiation incidents. Also the threat of radiological terrorism has become more apparent [3].

Radiation incidents severity can vary from the trivial to the fatal and may involve people and substantial economic penalties. An incident is called a *nuclear incident* when it involves a nuclear facility, especially a nuclear reactor. A *radiological incident* involves a sealed or unsealed radiation source and leads to an uncontrolled release of ionizing radiation or radioactive materials into the environment.

In this article we present the structure of an incident database with correspondence to the initiatives by the European Union (EU) and the International Atomic Energy Agency (IAEA). The International Nuclear Event Scale (INES) was introduced by the IAEA in order to enable prompt communication of safety significance information in case of nuclear accidents [4]. A number of criteria and indicators are defined to assure coherent reporting of nuclear events by different official authorities. There are 7 levels on the INES scale: 3 incident (anomaly, incident and serious incident) and 4 accident (accident without significant off-site risk, accident with off-site risk, serious accident and major accident).

There are several databases in EU countries [2]:

- In 1996, the National Radiological Protection Board, the Health and Safety Executive and the Environment Agency (in UK) jointly established the Ionising Radiations Incident Database (IRID) .
- The Qualified Expert Group of the French Radiological Protection Society has recently created an arrangement known as Retours d.Experience sur Les Incidents Radiologiques (RELIR).
- IAEA developed a RADiation EVent (RADEV) database which includes many different types of events that have occurred outside the nuclear power programme.

US Radiation Accident Registry, maintained at the Radiation Emergency Assistance Center/Training Site (REAC/TS). The REAC/TS Registry serves as a repository of medically important information documenting the consequences of these accidents [6].

In Bulgaria, NCRRP [5] is a specialized body within the Ministry of Health responsible for the issues of radiobiology and radiation protection. The main functions of Bulgarian Nuclear Regulatory Agency (BNRA) [1] are: State regulation of the safe use of nuclear energy and ionising radiation, the safety of radioactive waste management and the safety of spent fuel management. Also State Agency for Civil Protection (SACP) [7] is involved in protection the population and the national economy during crisis situations with radioactive materials.

2. Our Database

2.1.Objectives

The main objective of the database is to classify the enormous amount of information about the radiation incidents. In particular interest for the database is the information about the health of the participants in the incident. Also the database is intended to track the long term effect on the person's health. For this purpose the database needs to store large amount of medical data. This data is mainly generated during the radiation incident. But to track the health of the participants it is important to store information from the periodic medical examinations during the years after the incident.

Also the objectives of the database are:

- to learn from feedback experiences to avoid new incidents;

- to encourage exchange between physicians, radiation protection;
- professionals and non professionals.

2.2. Scope

The database is designed to cover radiation incidents and accidents with human participants. Usually two types of people may involve in a radiation incident:

- on-scene workers (workers occupationally exposed to ionising radiation);
- other people (members of the public).

2.3. Confidentiality

The database contains large amounts of sensitive and personal information about the participants in the incidents. This includes information that is protected under Bulgarian Law and especially under "The law for protection of the personal information". Under this law the name of the person and its EGN (Unique Personal Number) are personal information. When creating a database that includes such information it must be regulated in the special way. Also the medical data contained in the database is protected under several laws. To address these problems the database must ensure that:

(a) All the information in the database is stored in encrypted form.
(b) There is no unauthorized access to the database.
(c) All users of the database can access only information that is intended for them and needed for doing their job.
(d) Statistical information and aggregated information from the database must not be personalized.

2.4. Format

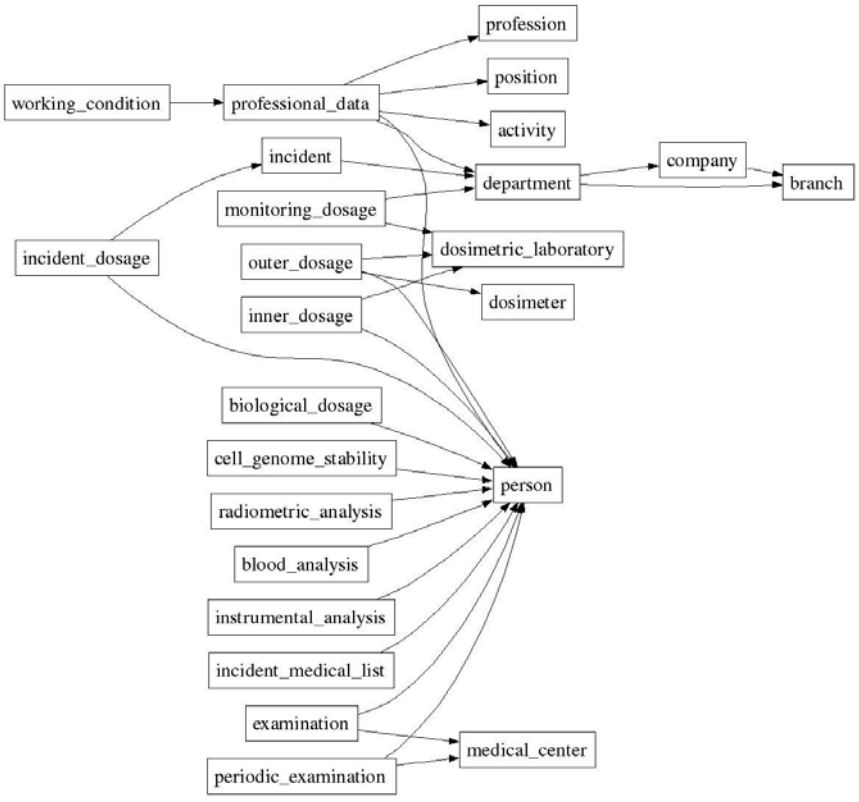
The database about the specific incident contains the following fields:

1. Case number
2. INES number
3. Date and time of the incident
4. Location of the incident
5. Name of the facility that is involved in the incident

6. Source of the radiation
7. Number of participants

The database about the specific participant in the incident contains the following fields:

1. Outer radiation dose of the participant
2. Inner radiation dose of the participant
3. Occupation of the worker
4. Incident Medical List
5. Clinical analysis
6. Instrumental analysis
7. Biological dosimetry
8. Periodic Medical Examination



3. Radioactive Incident in Sliven

The official report of BNRA states:

"On 15.10.2006 BNRA received information from SACP about a radioactive container found in Sliven. It was found during digging work in private property. The maximum measured dosage on the surface of the container was 170 uSv/h (this is about 1000 times natural radioactive background). The container is in the custody of the police in Sliven. The measures are taken for the transportation of the container to a safe storage. The investigation on the case continues. There is no danger for the population in the area."

We obtain additional information from Internet publications and people who were investigated at NCRRP.

- The container was found on 13.10 after 6 p.m. and was taken for the transportation to a safe storage on 15.10, 10 p.m.
- The container was sealed, two people tried to open it without success.
- The radioactive materials in the container are ^{192}Ir and ^{226}Ra.
- The measured dosage on the surface of the container is 170 uSv/h on the one side and maximum 350 uSv/h on the other side.
- Three meters form the container only the background radiation wasmeasured.

Seven people had been in contact with the container and they were sent to NCRRP for medical investigation. A simple calculation shows that the maximum dose hypothetically received by a person is 350 uSv/h x 50 hours = 17.5 mSv, which is less than the annual dose limit (20 mSv) for workers in radiation environment.

How this incident is stored in our database? The data are saved in following tables:

- Incident description table
- Person table
- Incidental Medical Form-sheet (Patient Accompanying Documentation Sheet) and the corresponding table
- Blood analysis table
- Examination table

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