

IAEA's Radiation Events Database (RADEV)

John Wheatley

Radiation Safety Section
Division of Radiation and Waste Safety
Department of Nuclear Safety
International Atomic Energy Agency
Vienna

Abstract

Whilst the use of ionizing radiation continues to bring benefits to many people throughout the world there is increasing concern at the number of reported accidents involving radiation. Such accidents have had an impact on the lives of patients, workers and members of the public, the consequences of which have ranged from trivial health effects to fatalities. In some cases, serious contamination also has occurred.

In order to reduce the number of accidents and to mitigate their consequences it is necessary to raise awareness of the causes of accidents and to note the lessons that can be learned. The International Atomic Energy Agency's (IAEA) database on unusual radiation events (RADEV) is intended to:

- (a) provide a repository of information on accidents, near-misses and any other unusual events involving radiation sources not directly involved in the production of nuclear power or its fuel cycle;
- (b) categorize events in a standardized manner to facilitate the search for events fitting particular profiles, the identification of causes and the lessons to be learned;
- (c) provide a means to analyze trends in radiation events; and
- (d) provide summary descriptions of events that can be used directly as training material.

It is also expected that RADEV will help Member States, the IAEA and other organizations to identify priorities in their radiation safety programme to facilitate the efficient allocation of resources.

1. Introduction

The International Atomic Energy Agency, in addition to facilitating the transference of technology that utilizes the constructive properties of ionizing radiation, has a statutory function to establish international standards of safety and to provide for their application. The International Basic Safety Standards [1], which were jointly sponsored by FAO, IAEA, ILO, OECD/NEA, PAHO and WHO, establish requirements for protection against the risks associated with exposure to ionizing radiation and for the safety of sources.

Even though many governments have adopted these international standards into their own national arrangements, the number of radiological accidents that have been reported to the IAEA [2-18] implies that numerous radiation sources are not managed or regulated appropriately.

Global awareness of the magnitude and seriousness of the problem was raised in September 1998 at the first international conference on the 'Safety of Radiation Sources and the Security of Radioactive Material' held in Dijon, France.

The conclusions of this conference were drawn to the attention of the IAEA Board of Governors at the General Conference. Subsequently, the IAEA Secretariat was requested to prepare and implement an *Action Plan* on the 'Safety of Radiation Sources and the Security of Radioactive Material'. The *Action Plan*, which was endorsed by the Board of Governors and the General Conference in 1999 covers the following seven areas: regulatory infrastructures; management of disused sources; categorization of sources; response to abnormal events; information exchange; education and training; and international undertakings. One of the actions under 'Information Exchange' is for the IAEA secretariat to fully develop and maintain an international database on unusual radiation events (RADEV) and to make it available to Member States.

2. Overall Objectives of RADEV

RADEV includes many different types of events that have occurred outside the nuclear power programme. The overall objectives of RADEV are to:

- disseminate information on radiation events and feedback lessons learned that may help to prevent future accidents, or mitigate their consequences should they occur, and
- provide a tool to help Member States, the IAEA and other organizations to identify priorities in their radiation safety programme to facilitate the efficient allocation of resources.

In order to achieve these general objectives a centralized RADEV database is being established at IAEA's headquarters in Vienna to:

- provide a repository of information on accidents, near-misses and any other unusual events involving radiation sources not directly involved in the production of nuclear power or its fuel cycle;
- categorize events in a standardized manner to facilitate the search for events fitting particular profiles, the identification of causes and the lessons to be learned;
- provide a means to analyze trends in radiation events; and
- provide summary descriptions of events that can be used directly as training material.

RADEV is designed to capture lessons learned to be from radiation events and is not meant to be a real-time on-line database. A separate IAEA initiative concerned with developing a 24-hour reporting system for missing and found orphan sources.

3. Events to be included

The following events will be included in RADEV:

- events or potential events involving patients, workers or members of the public;
- events involving radiation sources which have been lost, found, stolen, or subject to unauthorized and inadvertent transfer/sale; and
- events that occurred during the transportation of sources that result or could have resulted

in the loss or degradation of control of radiation sources.

4. Management and Operation

The database has been designed to operate on a personal computer using Microsoft Access 97 or 2000. Copies of the RADEV software will be provided to selected organizations within Member States for their own use and users will be requested to provide data to IAEA on a regular basis. IAEA will manage and operate the international RADEV database and act as the central focal point for all users. IAEA will publish regular summary reports from RADEV and will provide electronic updates of the data to participating organizations. Confidentiality will be maintained by IAEA at all times and details such as names of individuals, hospitals and factories will not be divulged.

6. Implementation

The RADEV project is being implemented in 3 phases:

Phase 1: Establishment of the database. IAEA will collect currently available details of radiation accidents and test the software.

Phase 2 : Limited international trials. IAEA will provide a working version of RADEV to several international and national organizations (including professional organizations) for testing and evaluation. Feedback from the trials will be reviewed by IAEA and any necessary changes made to the software.

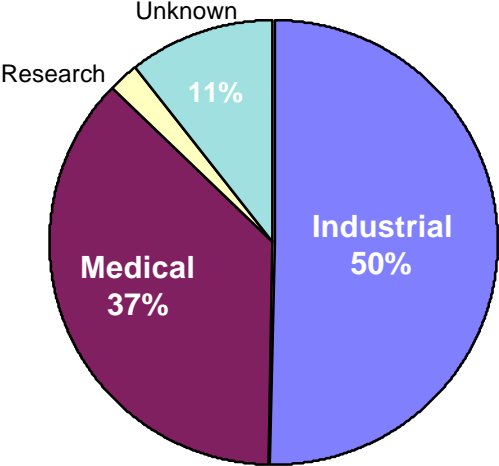
Phase 3: Distribution of RADEV. IAEA will collect data from participating organizations, compile international statistics and produce summary reports. Electronic copies of the summary reports and the updated database will be available to participating organizations.

RADEV is currently undergoing limited international trials (Phase 2).

7. Initial Statistics

To date 179 events have been recorded in RADEV. These are not representative of world-wide statistics, as they are simply some of the events known to IAEA. There are many more events to input, but it is felt that the currently available statistics, as shown below, would be of interest to a wide audience.

Figure 1. Distribution of events by general work sector.



Total events recorded to date = 179

- 24 Orphaned sources
- 205 Persons exposed below dose limits
- 44 Exceeded dose limits
- 14* Cases of 'radiation burns'
- 8* Amputations
- 5* Deaths

(* non-medical)

Figure 2. Number of industrial events by specific practice.

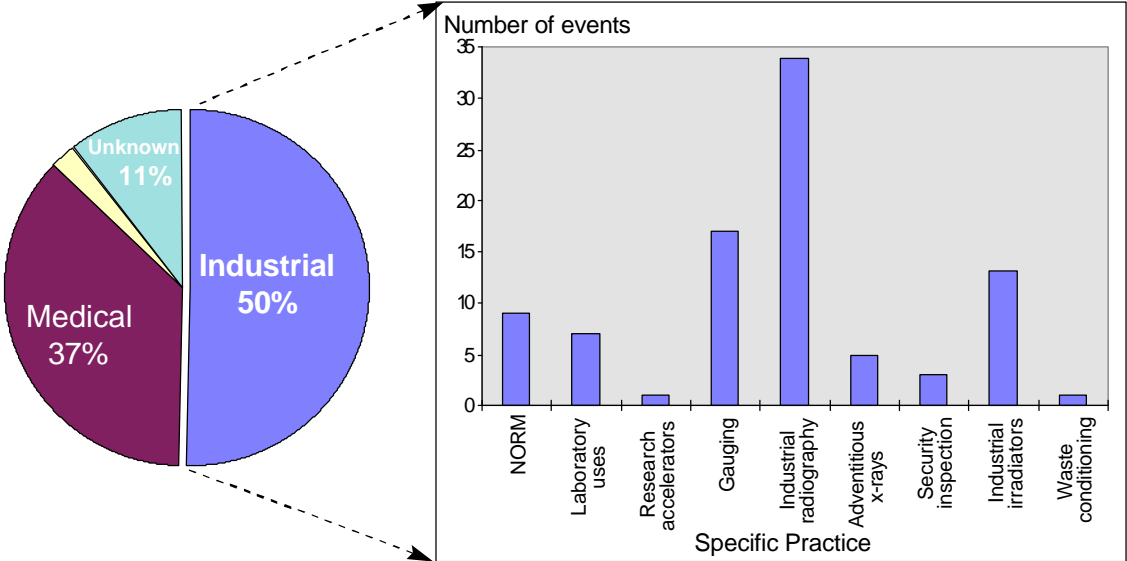


Figure 3. Causes of events in industrial practices.

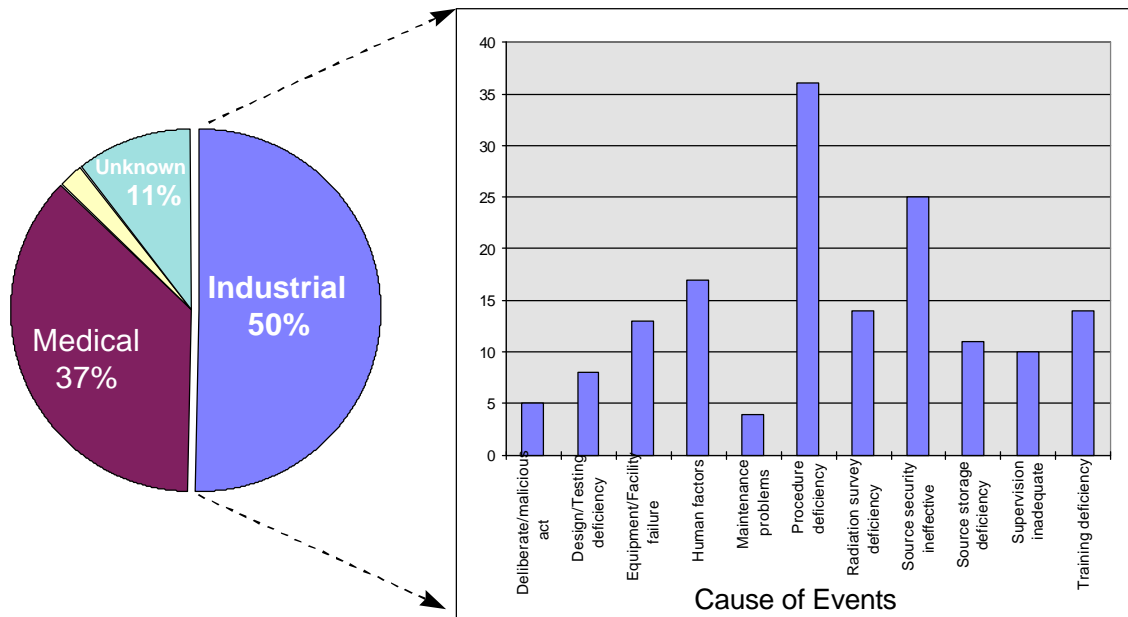


Figure 4. Number of medical events (involving patients) by specific practice.

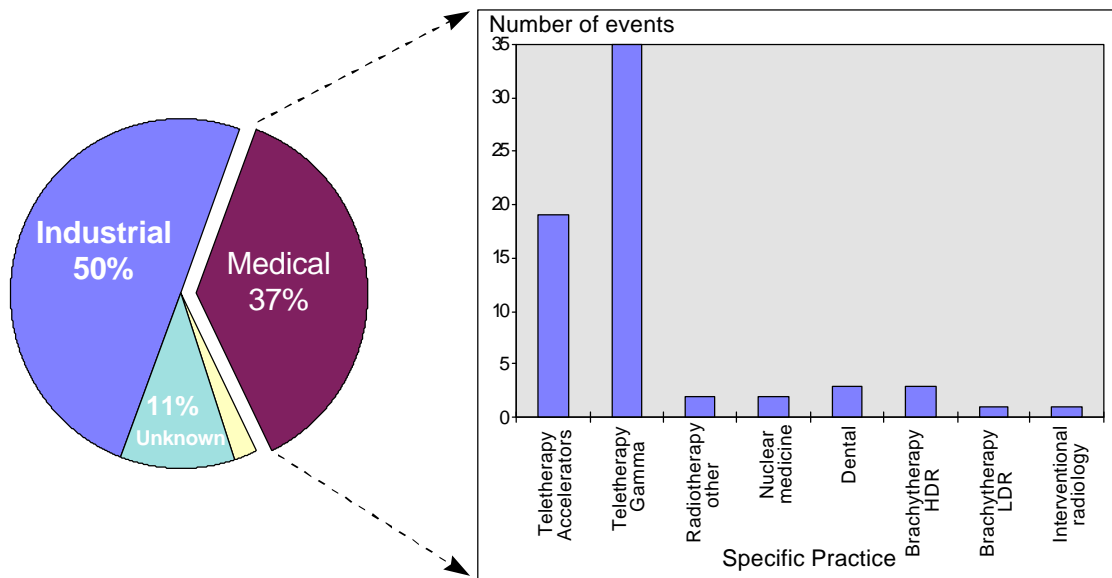
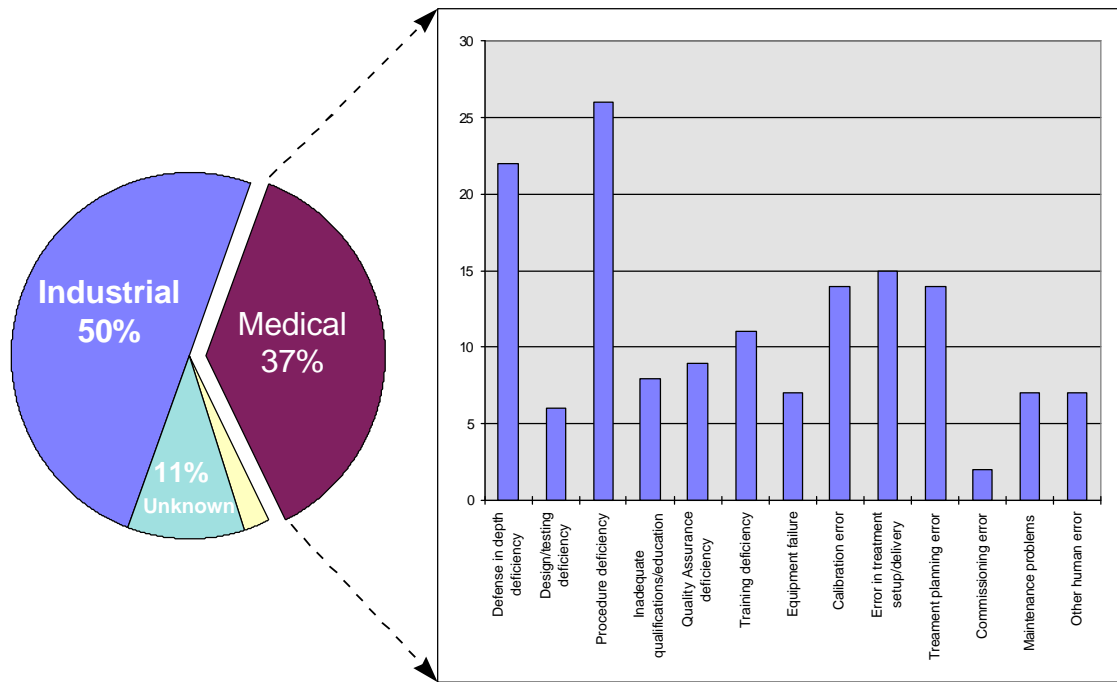


Figure 5. Causes of events in medical practices.



References

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY. International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).
- [2] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Goiânia, IAEA, Vienna (1988).
- [3] INTERNATIONAL ATOMIC ENERGY AGENCY, Dosimetric and Medical Aspects of the Radiological Accident in Goiânia in 1987, IAEA-TECDOC-1009, Vienna (1998)
- [4] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in San Salvador, IAEA, Vienna (1990).
- [5] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Soreq, IAEA, Vienna (1993).
- [6] INTERNATIONAL ATOMIC ENERGY AGENCY, An Electron Accelerator Accident in Hanoi, Viet Nam, IAEA, Vienna (1996)

- [7] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident at the Irradiation Facility in Nesvizh, IAEA, Vienna (1996)
- [8] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Tammiku, IAEA, Vienna (1998).
- [9] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Lilo, IAEA, Vienna (2000).
- [10] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Yanango, IAEA, Vienna (2000).
- [11] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Istanbul, IAEA, Vienna (2000).
- [12] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Sarov, IAEA, Vienna (2001).
- [13] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Gilan, IAEA, Vienna (Submitted for Publication).
- [14] INTERNATIONAL ATOMIC ENERGY AGENCY, Accidental overexposure of radiotherapy patients in Panama, IAEA, Vienna (in preparation)
- [15] INTERNATIONAL ATOMIC ENERGY AGENCY, The Radiological Accident in Samut Prakarn, IAEA, Vienna (in preparation).
- [16] INTERNATIONAL ATOMIC ENERGY AGENCY, Lessons Learned from Accidents in Industrial Irradiation Facilities, IAEA, Vienna (1996).
- [17] INTERNATIONAL ATOMIC ENERGY AGENCY, Lessons Learned from Accidents in Industrial Radiography, Safety Reports Series No. 7, IAEA, Vienna (1998).
- [18] INTERNATIONAL ATOMIC ENERGY AGENCY, Lessons Learned from Accidental Exposures in Radiotherapy, Safety Reports Series No. 17., IAEA, Vienna (2000).