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THE RADIATION BOOM

## Case Studies: When Medical Radiation Goes Awry

By [WALT BOGDANICH](#)

Americans today receive far more medical radiation than ever before. But patients often know little about the harm that can result when safety rules are violated and ever more powerful and technologically complex machines go awry.

Because New York State is a leader in monitoring radiotherapy and collecting data about errors, The Times decided to examine patterns of accidents there and spent months obtaining and analyzing records. Even though many accident details are confidential under state law, the records described 621 mistakes from 2001 to 2008. While most were minor, causing no immediate injury, they nonetheless illuminate underlying problems. Following are 18 accidents representing a variety of medical mistakes.

### October 2008 — Prostate Glands Misidentified

Five prostate cancer patients were treated incorrectly after a faulty ultrasound machine misidentified their prostate glands. One patient was irradiated incorrectly on 32 of 38 treatments; another on 19 of 45 treatments. After the ultrasound was repaired, quality checks were performed by the vendor, and not the consulting physics group that was servicing the facility. The therapist warned the oncologist that the treatment position appeared incorrect, but nothing was done about it.

### June 2008 — Therapist Mistakes Treatment on Alternate Days

A 63-year-old woman was to undergo two different treatments on alternate days — one to the upper lung and the other to the mediastinum — an area in the chest. But because of a therapist's error, her upper lung received one-tenth the prescribed dose and her mediastinum got 10 times the prescribed dose. The patient died of cancer later in the year. The hospital now requires two radiation therapists to attend whenever a complex treatment plan is being delivered. The therapists must also use a checklist to verify the patient's identity, the type of treatment, the dose and the site to be treated.

### December 2007 — Radioactive Seeds Implanted in Wrong Location

A patient's prostate cancer was underdosed by 50 percent — increasing the odds that cancer would recur — because a doctor implanted radioactive seeds in the wrong location. Consequently, the rectum and urethra received more radiation than intended. The radiation oncologist then

failed to promptly interpret a post-implant CT scan, which would have revealed the error sooner.

#### March 2007 – Radioactive Seeds Measured Incorrectly

A 31-year-old woman with vaginal cancer was overdosed because of confusion over the method of measuring the strength of radioactive seeds. The operator failed to enter the correct information into the treatment planning software, causing an overdose to her rectum and vagina. The patient faced an increased risk of radiation cystitis, rectal proctitis, and the formation of a fistula between the rectum and the vagina. Neither the physicist nor the radiation oncologist had prepared a treatment plan using iridium-192 – an isotope – in six years.

#### March 2006 – Wrong Patient Receives Treatment

Patient A had just completed treatment for a brain tumor received additional radiation intended for Patient B, who had breast cancer. Patient A did not realize that treatment had been completed when a therapist closed the patient's electronic chart and pulled up the chart for Patient B. A second therapist arrived, saw the breast cancer treatment had not been administered, and mistakenly administered it to the first patient.

#### December 2005 – Therapist Overrides a Computer Malfunction

A patient undergoing I.M.R.T. for prostate cancer was irradiated incorrectly after a therapist overrode a computer malfunction. After the guidance system froze, the therapist manually entered co-ordinates but left out a negative sign, shifting the aim in the wrong direction. Hospital policy required that a second therapist review the data before treatment, but that was not done.

#### November 2005 – Wrong Body Part Is Radiated; Computer Is Overridden

A male patient undergoing treatment for chondrosarcoma was radiated using the wrong body marks. Instead of the left chest and upper abdomen as prescribed, the patient's lower abdomen was radiated. The therapist also overrode the computer, which had the correct aiming point, and then failed to record the override on the patient's chart.

#### October 2005 – Old Photos Result in Wrong Body Part Being Radiated

Instead of the upper spine as prescribed, the patient's esophagus was treated. The therapist used a tattoo from a previous round of treatment to guide the radiation. The computerized set-up notes did not mention that the patient had received earlier radiation therapy, and another system downloaded an older photograph of the esophagus rather than current photographs. Afterward, the hospital introduced measures to solve the software problems and to ensure that second treatment areas were doubly marked. The oncologist did not believe that the mistake harmed the patient.

#### November 2005 – Therapist Errors Result in Radiation Overdose

A female patient with laryngeal cancer received a 47 percent overdose after a therapist left out

the wedges, which modify the beam, for eight treatments. A device that measures radiation produced an unexpected reading, but the therapist did not inform the physicist or the physician. The facility also lacked a written policy for verifying data entered manually into the computer system. Although it was treating 20 to 30 patients a day, a certified medical physicist was present only 20 percent of the time.

#### September 2005 — Temporary Workers Overdose Patient

A patient with breast cancer received a 50 percent overdose for 10 treatments because a wedge was mistakenly left out. The medical physicist failed to perform the first weekly chart check. The hospital reported that it had a staffing issue at the time of the event and that temporary workers did not have the same training or competency checks as the permanent staff.

#### July 2005 — Wrong Patient Is Radiated, Again

A patient received a 22 percent overdose of radiation after he underwent a treatment intended for another patient. Both patients were scheduled to be treated for tumors of the head and neck, and the technologist called up the first patient's treatment plan on the computer system. But since the first patient was unavailable at the scheduled time, the technologist escorted the second patient into the treatment room. The second patient was then treated using the first patient's protocol. After the first treatment was completed, the technologist realized that the wrong protocol was on the computer screen and the treatment was aborted. According to the radiation oncologist, the clinical impact was minimal. But this same facility had also treated the wrong patient in November 2004 and January 2005.

#### July 2005 — Therapist Radiates Wrong Body Part

After two correct treatments, a therapist set up the patient incorrectly, causing radiation to be administered to an unintended part of the body. The treatment computer detected the error and issued a warning, but the therapist overrode that warning. That therapist consequently had his override privilege withdrawn.

#### August 2005 — Staff Administers Wrong Radiation Dose

A 72-year-old man with cancer of the esophagus was to receive twice-daily treatments, but instead got only one a day for five days. The facility said the physics, dosimetry and therapy staff all failed to catch the error. After learning of the mistake, the patient refused twice-daily treatments and continued with the one-a-day treatments at a revised dose. A state inspection in November 2005 found staffing problems at the time of the mistake.

#### April 2005 — 27 Days of Radiation Overdoses

A 32-year-old breast cancer patient received 27 days of radiation overdoses — each three times the prescribed amount, because a wedge had been left out. The patient had to undergo multiple surgeries to close a wound caused by the overdose. The physics staff failed to notice the mistake

during their weekly checks of treatment records. The therapists failed to notice that during treatment, their computer screen clearly showed the wedge missing.

#### March 2005 – Computer Error Not Spotted

A male patient in his early 40s received three massive overdoses of radiation to his brain stem because a device that shaped and modulated the beam was mistakenly left open. A computer crash meant that vital treatment instructions were not saved. The physicist did not double-check the treatment plan until after the third treatment. The error was clearly displayed on the treatment screen, but two therapists did not notice it. The patient eventually died from the overdose.

#### February 2005 – Math Error Results in Higher Dose of Radiation

A patient received three treatments at a dose 83 percent higher than intended because of a calculation error. The therapists questioned the high dose and were still instructed to administer the treatment. The facility failed to follow policy and double-check dosage before the third treatment. A new policy was put in place requiring that physics work be double-checked before the first treatment.

#### October 2003 – Radiation Dose Not Checked

A 14-year-old girl received 10 treatments to her arm that were double the prescribed dose. The error would have been picked up on the first treatment if the facility had followed policy by verifying the patient's dose with a radiation measuring device. Also, the physicist did not double-check the doses.

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