U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 030-09588/86-01

Docket No. 030-09588

License No. 08-03604-04 Priority III Category G3

Licensee: Washington Hospital Center

110 Irving Street

Washington, D.C. 20010

Facility Name: Washington Hospital Center

Inspection At: Washington, D.C.

Inspection Conducted: January 10, 1986

Inspector: for John E. Glenn 2/11/86
Laurence F. Friedman, Ph.D., C.H.P. date
Senior Health Physicist

Approved by: John E. Glenn 2/11/86
John E. Glenn, Ph.D., Chief, Nuclear date
Materials Safety Section B

Inspection Summary: Special safety inspection conducted January 10, 1986 (Report No. 030-09588/86-01).

Areas Inspected: Notification of incident; investigation of incident; estimation of dose to Technologist A.

Results: One violation was identified: operation of teletherapy unit with a malfunctioning interlock.

DETAILS

1. Persons Contacted

Kenneth Williams, Radiation Safety Officer (RSO)
Charlie Wilkerson, ARRT, Radiation Therapy Technologist
Fay Henderson, RT, Chief Therapy Technologist
Ebrahim Norouzi, MD, Chief, Radiation Therapy Department
Pat Horn, Dosimetrist
Technologist A, RT
*Barbara Ritz, Assistant Administrator for Ambulatory Services
*Dunlop Ecker, President
*Jay Shiver, Associate Administrator for Clinical Affairs

*Denotes those present at exit interview

2. Notification of Incident

At approximately 3:00 p.m. on January 9, 1986, NRC Region I was notified by the licensee that, on that morning, the door interlock on the AECL Theratron 780 cobalt-60 teletherapy unit was found to be malfunctioning during routine morning startup tests. The RSO verified that the interlock was not working, and instructed the technologists to be very careful in opening the door to the therapy room to be sure the source was in the shielded position. While the RSO was searching for information necessary to repair the interlock, he was informed that one of the technologists had entered the room with the source exposed for patient treatment. The technologist stated that she thought she heard the source move to the shielded position, verified that all the indicator lights showed that the source was not exposed, and entered the room. The technologist was pulling the wedge from the block tray when a second technologist called to her from outside the room that the source was exposed and hit the switch to cause the source to return to the shielded position. The timer and elapsed-time indicator at the control panel showed, upon subsequent inspection, that the treatment had not been completed. Treatments were then suspended until the interlock was repaired, about two hours later. The technologist's film badge was sent for immediate processing.

3. Investigation of Incident

On January 10, 1986, a Region I inspector conducted a special inspection of the licensee's program. The Dosimetrist stated that she arrived around 7:00 a.m., and conducted routine startup tests on all instruments, including the cobalt-60 unit, and found that the door interlock was not working. She notified Technologist A upon her arrival at 7:25 a.m. She also notified the Chief Technologist and the RSO.

Technologist A stated that she arrived at 7:25 a.m. and turned on power to the various therapy units. She was told by the Dosimetrist that the interlock on the cobalt-60 treatment room door was not working. She asked

the Dosimetrist what that meant and was told that the machine would not turn off if the door was opened during treatment. The Dosimetrist said she would tell the Chief Technologist and the RSO. Technologist A noted the malfunction in the log book and proceeded to do the daily output check of the cobalt unit. The Chief Technologist came by and told her to go ahead and treat patients. Two patients were treated before the incident described above in Paragraph 2 occurred at about 8:30 a.m.

Technologist A confirmed the details as reported in Paragraph 2 above. The incident occurred during the second field of a tangential breast treatment, with the gantry of the isocentric therapy unit oriented at 130 degrees (angled up, head on far side of table from the door). Technologist A stated she heard the source slide to the shielded position, checked the console lights and the light over the door, and noted that they all indicated the source was not exposed. She stated that she checked the radiation monitor as she entered the room, and noted that it, too, indicated the source was not exposed. She removed the wedge from the block tray on the source head, and was disassembling the arm support attached to the treatment table when the other technologist called her name. She looked up and saw that lights indicated the source was exposed, and immediately removed the patient from the room. She stated she does not remember hearing the source move to the exposed position while she was in the room, nor did she hear the source move to the shielded position when the other technologist hit the switch. The technologists notified the RSO and Chief Technologist of the incident.

Technologist A stated that the cobalt unit had, on a previous occasion, come on while a treatment was being set on the console. The inspector discussed this with the RSO, who stated the event occurred December 27, 1985. Review of the log book revealed the notation that the source would not return to the shielded position with the usual controls and the console key had to be used. There was no exposure to personnel as the result of this malfunction. The NRC estimates a maximum dose to the patient of 10 rads, a negligible dose compared to the treatment dose. The RSO stated that no notation was made in the patient chart. The problem was attributed by the manufacturer to a malfunctioning timer, and a new timer was installed by the RSO. The problem did not recur after the repair was made.

The second technologist stated that the incident involving Technologist A occurred during his absence from the console for a short time when he went to get a drink of water while Technologist A set up a treatment. When he returned, he found that the console indicator lights were on, the warning lights above the door were lit, and the radiation monitor warning lights were lit, indicating the source was exposed. The door to the treatment room was open. He stated the timer was running and had been set for 1.57 minutes. He saw Technologist A in the TV screen and mirror, called to Technologist A and hit the treatment button on the timer, stopping the treatment. The timer stopped at 1.47 minutes elapsed time. He stated that Technologist A was bending over the source head and might have had her forearm in the beam from the exposed source.

The Chief of the Radiation Therapy Department stated that he had been informed of the interlock malfunction before the incident occurred. He stated that he did not inquire whether treatments had been suspended.

The RSO stated that it had probably been his responsibility to halt treatments, and that he had failed in that responsibility. It appeared to the inspector that, at the time the interlock malfunctioned, no one had a clearly understood responsibility to halt treatments. It also appeared that none of the those supervisors who were informed of the malfunction recognized the hazard to employees or patients or the regulatory requirement to suspend operations.

The finding that the therapy machine was used for a teletherapy treatment while it was known that the door interlock was malfunctioning is an apparent violation of License Condition 17.D.

4. Estimation of Dose to Technologist A

The incident was reenacted in the presence of the inspector. The inspector estimated that Technologist A was in the treatment room for 10 seconds while the source was exposed, exclusive of the time she spent bending over the treatment head. In addition, she spent one second near the head removing the wedge, and two seconds bending over the source head while releasing the patient from the arm support. It was only during these last two seconds that she might have had any part of her body in the direct beam. Based on these observations, the inspector calculated that Technologist A's whole body dose was about 0.7 millirem, which agrees with the reading "M" (less than 10 millirem) reported by the film badge service.

The dose rate from the beam at a point 80.5 centimeters (cm) from the source was 124 rads in 1.57 minutes. During the reenactment the inspector measured the position of Technologist A's arm as 10 cm from the bottom of the block support tray, or 64.5 cm from the source. If Technologist A had had her forearm in the beam for as much as two seconds, the maximum extremity dose she would have received was 4 rem. This is within the regulatory limit in 10 CFR 20.101(a) for extremity exposure.

During the reenactment, the inspector noted that the required radiation monitor was not alarming when the source was exposed. There appeared to be two causes for this. With the gantry at 130 degrees, much of the scattered radiation is shielded from the monitor by the beam catcher. A more important reason is that the monitor, a "Primalert 10," has two alarm settings, high (20 millirem/hour) and low (2.5 millirem/hour). The monitor was set on "high," which made it much less sensitive to scattered radiation. There was no apparent reason for setting the alarm on the "high" setting, as no false alarm occurred with the alarm on the "low" setting. The RSO could offer no explanation. When a phantom was placed in the beam of the exposed source, the monitor alarmed even at the "high"

setting. Since the part of the patient in the beam during the incident was smaller than the phantom, the inspector was unable to determine whether the monitor would have indicated a source-exposed condition during the incident.

The licensee agreed to operate the monitor henceforth on the "low" setting.

No violations of NRC rules, regulations or license conditions were identified.

5. Exit Interview

The inspector discussed the inspection findings with the individuals noted in Section 1. The inspector stressed the gravity of the violation identified, and noted that several persons with supervisory responsibility were aware of the malfunction, yet did not take appropriate action in view of both the hazard and the regulatory requirement. The inspector also reviewed the Commission's enforcement options.