NRC FORM 591M
(04-2022)

U.S. NUCLEAR REGULATORY COMMISSION

Materials Inspection Report

1. Licensee/Location Inspected:	2. NRC/Regional Office
Mercy Hospital Springfield 1235 E. Cherokee St. Springfield, MO 65804 Report Number(s) 2022001	Region III U. S. Nuclear Regulatory Commission 2443 Warrenville Road, Suite 210 Lisle, IL 60532-4352

3. Docket Number(s)	4. License Number(s)	5. Date(s) of Inspection
030-02285	24-00866-02	06/27/2022-10/17/2022

LICENSEE:
The inspection was an examination of the activities conducted under your license as they relate to radiation safety and to compliance with the Nuclear Regulatory Commission (NRC) rules and regulations and the conditions of your license. The inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector. The inspection findings are as follows:

☐ 1. Based on the inspection findings, no violations were identified.

☐ 2. Previous violation(s) closed.

☑ 3. During this inspection, certain of your activities, as described below and/or attached, were in violation of NRC requirements, and were assessed at Severity Level IV, in accordance with the NRC Enforcement Policy.

A. The violation(s), specifically described to you by the inspector as non-cited violations, are not being cited because they were self-identified, non-repetitive, corrective action was or is being taken, and the remaining criteria in the NRC Enforcement Policy were satisfied.
(Non-cited violation(s) was/were discussed involving the following requirement(s)

B. The following violation(s) is/are being cited in accordance with NRC Enforcement Policy. This form is a NOTICE OF VIOLATION, which may be subject to posting in accordance with 10 CFR 19.11.
(Violations and Corrective Actions)

A. 10 CFR 20.1902(a) requires that the licensee post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION RADIATION AREA."

(continued on next page)

Statement of Corrective Actions

I hereby state that, within 30 days, the actions described by me to the Inspector will be taken to correct the violations identified. This statement of corrective actions is made in accordance with the requirements of 10 CFR 2.201 (corrective steps already taken, corrective steps which will be taken, date when full compliance will be achieved). I understand that no further written response to NRC will be required, unless specifically requested.

TITLE	PRINTED NAME	SIGNATURE AND DATE
LICENSEE'S REPRESENTATIVE	Kim Tilley	Kim Tilley
NRC INSPECTOR	Elizabeth D. Tindle-Engelmann	Elizabeth D. Tindle-Engelmann Digitally signed by Elizabeth D. Tindle-Engelmann Date: 2022.10.21 09:52:53 -05'00'
BRANCH CHIEF	Michael A. Kunowski	Michael A. Kunowski Digitally signed by Michael A. Kunowski Date: 2022.10.21 09:24:38 -05'00'

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Contrary to the above, on June 27, 2022, the licensee's nuclear medicine hot lab, a radiation area with a radiation dose rate of approximately 80 millirem in one hour at 30 centimeters from the radiation source was not posted with a sign bearing the radiation symbol and the words "CAUTION RADIATION AREA."

Upon identification of the issue the licensee immediately posted signage indicating the area was a radiation area. The licensee also obtained shields that reduced the radiation dose rates in the area.

B. 10 CFR 35.610(a)(1) requires, in part, that a licensee shall secure remote after loader unit console keys when not in use or unattended.

Contrary to the above, on June 28, 2022, the licensee failed to secure remote after loader unit console keys when not in use and unattended. Specifically, upon arrival for the inspection the NRC found the remote after loader unit console keys in the console when the unit was not in use and was unattended.

Upon identification of the violation the licensee immediately placed the keys in a secure location. Additionally, the licensee conducted training to remind staff of the requirement to maintain security of the console keys.

C. 10 CFR 20.1502(a)(1) requires, in part, that each licensee monitor occupational exposure to radiation from licensed and unlicensed radiation sources under the control of the licensee and shall supply and require the use of individual monitoring devices by adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of the limits in 10 CFR 20.1201(a).

Contrary to the above, for periods between August of 2019 and June of 2022, the licensee failed to monitor occupational exposure to radiation from licensed and unlicensed radiation sources under the control of the licensee and did not require the use of individual monitoring devices by adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of the limits in 10 CFR 20.1201(a)(2)(ii). Specifically, one authorized user of yttrium-90, whose occupational exposure to licensed and unlicensed sources of radiation was likely to exceed 10 percent of the limits in 10 CFR 20.1201(a)(2)(ii), often failed to wear their supplied extremity dosimeter, thereby preventing the licensee from monitoring their occupational shallow-dose equivalent exposure to the skin of the whole body or the skin of the extremity.

Upon identification of the violation the licensee determined that the individual was likely to receive a dose in excess of 10 percent of the limits in 10 CFR 20.1201(a)(2)(ii) but was unlikely to exceed the occupational limit. As a corrective action the licensee provided training to the individual on the proper use of extremity dosimeters.

NRC FORM 592M
(10-2020)

U.S. NUCLEAR REGULATORY COMMISSION

Materials Inspection Record

1. Licensee Name:	2. Docket Number(s):	3. License Number(s)
Mercy Hospital Springfield	030-02285	24-00866-02

4. Report Number(s):	5. Date(s) of Inspection:
2022001	06/27/2022-10/17/2022

6. Inspector(s):	7. Program Code(s):	8. Priority:	9. Inspection Guidance Used:
Elizabeth D. Tindle-Engelmann	02240	2	87130, 87132

10. Licensee Contact Name(s):	11. Licensee E-mail Address:	12. Licensee Telephone Number(s):
Jesse Whitlock, RSO	Jesse.Whitlock@Mercy.Net	417-820-7705

13. Inspection Type:	14. Locations Inspected:	15. Next Inspection Date (MM/DD/YYYY):
☐ Initial	☑ Main Office ☐ Field Office	06/27/2024
☑ Routine ☑ Announced	☐ Temporary Job Site ☐ Remote	☑ Normal ☐ Extended
☐ Non-Routine ☐ Unannounced		☐ Reduced ☐ No change

16. Scope and Observations:

This was an announced routine inspection. The licensee was a multi-site medical facility located in Springfield, Missouri, with authorization for diagnostic and therapeutic uses of byproduct material pursuant to 10 CFR 35.100-400, a remote afterloader unit pursuant to 10 CFR 35.600, yttrium-90 microspheres pursuant to 10 CFR 35.1000, a cesium-137 instrument calibrator, and a cesium-137 blood irradiator. The licensee's radiation safety officer (RSO) was a full-time employee who was onsite daily. The RSO was responsible for program reviews, equipment calibrations, and oversight of the radiation protection program. The licensee maintained a radiation safety committee that met quarterly.

At the main hospital, the nuclear medicine department was staffed with 10 full-time nuclear medicine technologists. The licensee's nuclear medicine staff administered approximately 30 PET and SPECT doses per day, 4 doses of unsealed byproduct material requiring a written directive per week, and 1 microsphere doses per month. The department had a radiopharmacy that compounded unit doses of technetium-99m. The radiopharmacy received one molydemum-99/technetium-99m generator per week. Unit doses of radiopharmaceuticals with fluorine-18, gallium-68, iodine-123, iodine-131, radium-223, and copper-64 were obtained as needed from a licensed radiopharmacy. Two offsite nuclear medicine clinics performed a lower volume of diagnostic studies using technetium-99m.

The radiation oncology department was staffed by multiple full-time authorized medical physicists that supported the high dose rate (HDR) remote afterloader program. The radiation oncology department delivered HDR treatments using gynecological and breast applicators.

Observations

The inspector toured the three authorized locations in Springfield, Missouri. The inspector observed ambient radiation level surveys, dose calibrator quality control, dose preparation and administration, and remote afterloader spot checks. The licensee's staff demonstrated decay in storage procedures, package receipt procedures, sealed source inventories, and a microsphere dose preparation.

Interviews with licensee personnel indicated adequate knowledge of radiation safety and security concepts and procedures. The inspector reviewed the following records: area surveys, dose calibrator calibrations, dosimetry, HDR spot checks, HDR full calibrations, package receipt, package return, program reviews, radiation safety

Materials Inspection Record (Continued)

committee meeting minutes, radionuclide breakthrough testing, sealed source leak tests and inventories, select policies and procedures, spill reports, training, treatment plans, waste logs, and written directives.
The inspector performed independent and confirmatory radiation measurements using a RadEye G (serial number: 30337, calibration expiration: 03/29/2023).

Three severity level IV violations were identified as a result of this inspection.

The licensee's radiopharmacy compounded unit doses of radiopharmaceuticals containing technetium-99m on weekdays to supply the main hospital. The compounded unit doses were placed into shields on a cart. The shields did not have a top so the unit doses produced streams of radiation coming from the uncovered end of the shields. This created a radiation area in the licensee's radiopharmacy and hot lab. On June 27, 2022, the licensee's nuclear medicine hot lab, was a radiation area with a radiation dose rate of approximately 80 millirem in one hour at 30 centimeters from the radiation source. However, the area was not posted with a sign bearing the radiation symbol and the words "CAUTION RADIATION AREA." This is a violation of 10 CFR 20.1902(a). Upon identification of the violation the licensee immediately posted signage indicating the area was a radiation area. To reduce the dose rates in this area, the licensee procured unit dose shields that shielded the unit doses from all directions.

During the facility tour of the radiation oncology department, the inspector and RSO arrived at the HDR unit prior to the physics staff. Upon arrival, the inspector found the remote afterloader unit console keys in the console when the unit was not in use and was unattended which is a violation of 10 CFR 35.610(a)(1). The licensee immediately placed the keys in a secure location. Additionally, the licensee conducted training to educate staff on the requirement to maintain security of the console keys. While the console keys were unsecure, the remote afterloader unit remained in a locked storage cabinet and the source remained in the locked position. The console was protected by a password while the console keys were left unattended.

During a review of the dosimetry records the inspector observed that one authorized user of yttrium-90 whose occupational exposure to licensed and unlicensed sources of radiation was likely to exceed 10 percent of the limits in 10 CFR 20.1201(a)(2)(ii) often failed to wear their supplied extremity dosimeter. The inspector confirmed that the licensee provided the individual extremity dosimetry based on their likelihood to exceed 10 percent of the limits in 10 CFR 20.1201(a)(2)(ii). The individual's failure to wear the monitoring devices prevented the licensee from monitoring their occupational shallow-dose equivalent exposure to the skin of the whole body or the skin of the extremity which is a violation of 10 CFR 20.1502(a)(1). Upon identification of the violation the licensee determined the individual was unlikely to exceed the occupational limit through review of whole body dosimetry and interviews regarding work practices. The license estimated that the individual received 6871 mrem to the extremity in 2020 and 7190 mrem to the extremity in 2021. As a corrective action the licensee provided remedial training to the individual on the proper use of extremity dosimeters.