SENTARA.

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K-8
MS-16

U.S. Nuclear Regulatory Commission
Region I Office
Division of Nuclear Materials Safety
475 Allendale Road
King of Prussia, PA 19406

To whom it may concern, attention mail control 139682:

Please accept this revision and addition to our amendment request dated October 25, 2006 for the Sentara Careplex Hospital, NRC license number 45-09087-01. 03003331

Regarding written directives for cesium-131 seeds for prostate implants:

A written directive form is attached and will be used which includes:

Before implantation: treatment site, the radionuclide, and dose; and

After implantation but before completion of the procedure:
radionuclide, treatment site, number of sources, total source strength and exposure time

Procedures for administrations requiring a written directive will describe how to quantify the total dose to the treatment site as well as the total dose to other sites upon completion of the administration to confirm that the administration is in accordance with the written directive.

Also please see attached procedures for ensuring release of patients in accordance with 10 CFR 35.75. Our Radiation Safety Committee has approved this change.

If you should have any questions or comments regarding this amendment application, please do not hesitate to contact David Weimer, Chief Physicist, at (757) 827-2444 or our Radiation Safety Officer, Sandy Wolff, at (757) 388-3030.

Sincerely,

Toric Bashay
Interim Director, Facilities and Patient Care Services
Sentara Careplex Hospital

139682
NMSS/RGN1 MATERIALS-002

Physician's Directive – Prostate Seed Implant
Department of Radiation Oncology

Patient Name: _____ R.O. #: _____

S.S.N.: _____ D.O.B.: _____

Address: _____ Phone: _____

Referring Physician: _____

Initial Prescription

Treatment Type: Permanent prostate seed implant Dose Desired: _____ Gy

Grade / Stage: _____ PSA: _____ Volume: _____ cc

Radionuclide: ( ) Pd-103 ( ) I-125 ( ) Cs-131

Total Activity Desired: _____ (U or mCi) from _____ seeds with an activity of _____ (U or mCi) / seed

Radiation Oncologist: _____ Date: _____

Date of Order: _____ Total Activity: _____ (U or mCi)

What was ordered: _____

Physicist: _____

The patient's ID must be confirmed by two separate means prior to procedure. The ID may be verified by the physician, physicist, nurse or technologist; however, the Radiation Oncologist is responsible for insuring that it is done prior to the procedure.

Initials

Date: _____ ( ) Name ( ) SSN ( ) Phone ( ) Address ( ) DOB _____

Radiation Oncologist: _____ Date: _____

Final Prescription

Treatment Type: Permanent prostate seed implant

Radionuclide: ( ) Pd-103 ( ) I-125 ( ) Cs-131

Total Activity Implanted: _____ (U or mCi)

Radiation Oncologist: _____ Date: _____

Seeds Implanted: _____ Seed Activity: _____ (U or mCi) Implanted Activity: _____ (U or mCi)

Needles Used: _____

Patient release following permanent prostate brachytherapy using ^{131}Cs

William S. Bice, Jr., Ph.D.

Background:

The half-life for 131Cs is 9.7 days, compared to 103Pd with a half life of 17 days and 125I with a half-life of 60 days. Even though the increased dose rate from 131Cs allows the use of a lower prescription dose, the initial dose rate is much higher than for cesium than for either iodine or palladium. Coupled with the higher average energy for 131Cs, the exit dose from the patient is much closer to regulatory patient release limits than for the other two isotopes. Typical GM-tube survey meters exacerbate the problem as they tend to over-respond at lower energies.

Reference documents:

The governing federal regulation is Title 10 of the Code of Federal Regulations, Part 35, specifically paragraph 35.75. Two sections of this paragraph apply to prostate brachytherapy.

1. The patient can only be released if the total lifetime dose to a member of the general public is less than 500 mrem.
2. If the possible lifetime dose to a member of the general public can be greater than 100 mrem, but still less than 500 mrem, the patient can be released but must be given release instructions.

How to apply these requirements is described in NUREG 1556, Vol. 9, Appendix U. Note this NUREG supersedes Regulatory Guide 8.39. This regulation can be accessed at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1556/v9/nureg-1556-9.pdf

The NUREG states that two methods may be used to determine whether the total lifetime dose can be shown to remain below the 500 mrem limit.

1. Calculation from administered activity
2. Measurement

Calculations:

1. Calculation: The dose to a member of the general public can be calculated from the following equation:

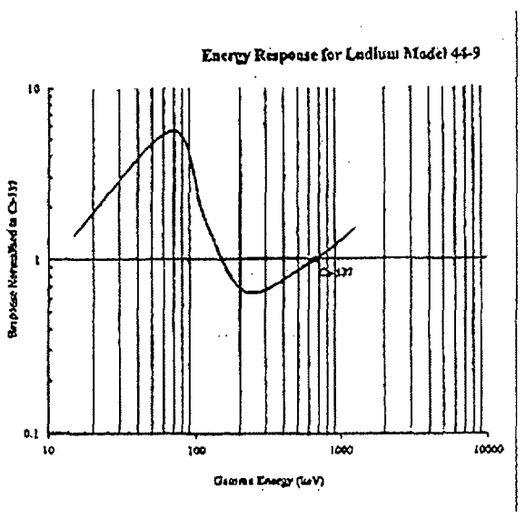
$$D(\infty) = \frac{34.6\ \Gamma\ Q_0\ T_p\ (0.25)}{(100\ cm)^2}$$

where, D(∞) is the lifetime dose (mrem),
Γ is the exposure rate constant for cesium = 0.124 mR m2 hr-1 mCi-1,
Q0 is the initial activity for the implant
Tp is the physical half life (9.7 days).
0.25 is an occupancy factor and a distance of 1 m = 100 cm is assumed.

2. This equation means that any patient with less than 48 mCi of 131Cs can be released. Since most of our patients are implanted with 200 to 300 mCi, it is rare to be able to release a patient based solely on the administered activity.
3. Note that you can decrease the occupancy factor, or include a factor for patient shielding in order to more realistically calculate the millicurie limit, but this requires that you document and justify your calculation.
4. More commonly the patient is released from cesium implants by measurement. By rearranging the equation above, the maximum exposure rate that can be measured at one meter, M, and still release the patient is

   M = (500 mrem) / 34.6 / 9.7 days / 0.25 = 5.96 or 6 mrem hr-1

5. Be aware that most survey meters over respond at low energies. An example of this is shown below for the Ludlum Model 44.9.



Patient instructions:

An example of patient instructions is given in the NUREG and shown below.