A. Purpose
This policy is adopted to minimize unnecessary exposure of physicians and other clinical personnel who participate in a surgery of a patient containing radioactive materials administered with therapeutic intent. It describes pre-op preparation, proper shielding, proper dosimetry of physician(s) and all involved personnel, responding to and reporting of spills and emergencies, and post-procedure waste management.

B. Applicability/scope
This policy applies to all personnel involved in the surgery. This policy is only enacted for patients arriving to the hospital that set off the radiation detectors as well as for known in-house therapy patients that undergo a surgical procedure.

C. Definitions
1. Dosimeter – a device that records exposure to ionizing radiation.
2. DPM – Disintegrations per minute
3. Whole Body – the area between your neck and your waist, where most of your vital organs are located. A whole body dosimeter measures the radiation exposure to this area. The annual limit of exposure is 5,000 mRem.
4. Extremities – arms, legs, feet and hands. A ring dosimeter measures the radiation exposure to the hands. The annual limit of exposure is 50,000 mRem. The weekly limit to exposure is 1500 mRem, mRem – a unit of measurement for absorbed dose.
5. PPE – Personal Protective Equipment. Potential equipment for this protocol: Lead Apron, Lead glasses.
7. RS – Radiation Safety or Staff of Radiation Safety.

D. Procedures
1. Pre-op Preparation
   a. Radiation Safety (RS) personnel will determine the isotope type and activity either by an interview with a conscious responding patient, checking accessible patient records, or by surveying the patient with the isotope identifier and appropriate exposure survey meter. The exposure measurements will be made at 1 m and 10 cm from the anatomy of interest. If the patient is experiencing a severe emergency this exposure reading should not interfere with any treatment.
   b. RS will determine from isotope type, exposure rate and location of surgery/anatomy of interest what course of action to take.

2. Procedure Room set-up and Communication
Surgery of Patient with Therapeutic Amounts of Radioactive Material

a. Interstitial implants or colloidal interstitial infiltration. Note that thyroid ablation with I-131 can be considered in this category if it has been at least 3 days since the initial uptake as nearly all of the isotope will be localized in the thyroid.
   (i) For a surgical procedure involving the removal of any interstitial implants or colloidal interstitial infiltration tissue RS will prepare for containment and disposal of the excised tissue.
   (ii) For any surgical procedure adjacent to or involving the excision of any interstitial implants or colloidal interstitial infiltration tissue the physician should be advised of the following:
       a) If possible, the anatomy of interest should be avoided.
       b) If the radioactive tissue is to be excised, this should be done at either the very beginning or very end of the procedure, if possible.
       c) Use of thick rubber gloves or multiple layers of surgical gloves and long forceps/scissors for any tissue removal or procedure adjacent to the anatomy of interest when this can be accomplished without compromising patient safety.
       d) Eye protection must be worn.

b. Radioisotopes in the bloodstream. Note this includes thyroid ablation with I-131 in the first 3 days after initial uptake as not enough has localized to the thyroid.
   (i) To prevent spread of contamination RS will set up absorptive padding around the surgical procedure.
   (ii) The physician should be advised of the following:
       a) The amount of time it will take to accumulate the weekly extremities dose limit of 1.5 rem (Table 1 in the references gives the times for some common isotopes). If such procedures occur no more than once every 13 weeks then the dose limit may be increased to 25 rem.
       b) Avoid build-up of blood on gloves or gown. This can be accomplished with multiple layers of gloves.
       c) For high energy beta emitters (Sm-153, P-32, Y-90, and Au-198) thick rubber gloves or triple/quadruple layers of surgical gloves and long forceps/scissors should be used if patient safety will not be compromised.
       d) Eye protection must be worn.

c. All personnel involved must wear a whole body dosimeter as prescribed in Radiation Safety SOP.7.82 Dosimetry procedures. The surgeon(s) and any other hands-on personnel must also wear ring dosimeters also prescribed in SOP.7.82. If the ring dosimeters inhibit dexterity then Table 1 above should be used to estimate dosimetric quantities to the extremities.

3. Response to spills and emergencies
   a. In spills and emergencies that might occur during the procedure, patient safety should always take precedence over radiation safety. RS shall consult with attending physicians to determine best course of action.
   b. If an injury occurs during surgery, where PPE is cut or torn, radioactive material may be introduced to the wound. In addition to ordinary treatment of the wound, the Radiation Safety Officer shall be consulted with regard to any possible radiation intake or hazard.
Surgery of Patient with Therapeutic Amounts of Radioactive Material

Environmental Health & Safety 3

4. Surgery and Post-procedure
   a. RS will survey every individual exiting the room both during and after the procedure is complete. Survey of the operating team personnel should include surfaces that could potentially be contaminated (hands, feet and surface of body) using an appropriate survey meter. When surveyed, the personnel should stay on the step off pad. If the person is cleared, he/she can step off the absorbent paper and exit the room. If not, he or she needs to take off the contaminated protective layers on the absorbent paper and will be surveyed again for clearance. Waste that reads significantly above background radiation should be collected in black bags and stored in the freezer room maintained by RS until it is “indistinguishable from background”. Waste with normal background readings may be disposed of according to the waste type (i.e. regulated medical waste, universal waste, linens, etc.). Non-disposable contaminated items will be sequestered by RS for Decay-in-Storage and returned when the contamination is “indistinguishable from background”.
   b. Any excised radioactive tissue shall be properly bottled for retention, properly labelled and stored in cold storage until decay permits safe handling.
   c. RS will survey operating room after all identified contaminated waste is disposed and all personnel are dismissed. Any discovered residue or spill will be properly cleaned as outlined previously in the spill management section above.

E. Emergency contact

1. Radiation Safety: 212-305-0303
F. Medical Surveillance

N/A

G. Recordkeeping

1. Incident and dosimetry reports will be saved in Radiation Safety.

H. Appendices

N/A

I. Forms


J. References

1. Article 175 of the Code of the City of New York.
2. NUREG 1556 Vol. 9 Rev.2; Appendix U: Model Procedure for Release of Patients or Human Research Subjects Administered Radioactive Materials.
5. NCRP Report No 37 and No 155.
6. **Table 1**: Approximate time for hands in the peritoneal cavity to receive 1.5 rem. The values for Au-198 and P-32/Y-90 were found in NRCP report no. 37 for single-gloved measured dose rate (these values almost double for an extra layer of gloves). The values for I-131, Sm-153 and Lu-177 are derived using the gamma exposure rate constant.

<table>
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<tr>
<th>Initial Activity (mCi)</th>
<th>I-131 (min)</th>
<th>Au-198 (min)</th>
<th>P-32/Y-90 (min)</th>
<th>Sm-153 (min)</th>
<th>Lu-177 (min)</th>
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Dose rate constant at 1m (mR/mCi-hr) 0.212 0.222 0 0.045 0.104