Purpose: Due to the short half-life and high energy of Cesium-131 (131Cs), the exposure rate outside the patient could potentially increase radiation exposure to hospital staff and exceed the maximum patient release exposure rate limit. A calculation technique has been developed to estimate the exposure rate at 1 meter from the patient, for prostate patients receiving 131Cs implants.

Methods: In our calculation for each patient, all 131Cs sources were treated as one single source, and the point on the prostate with the shortest distance to skin surface was selected as the effective source position. Attenuation inside the patient was calculated based on the attenuation coefficient of 30 keV photons in water, assuming homogeneous patient density. This calculation technique was evaluated on our first 25 131Cs implant patients. For comparison, the exposure rate at approximately 1 meter inferior to patient perineum was measured prior to patient release using the Inovision 451P-RYR survey meter.

Results: The distance from the edge of the prostate to skin surface along the inferior direction was the shortest in all 25 patients. The mean of the calculated exposure rates at 1 meter from skin surface was 0.53 mR/hr, 0.53 mR/hr, 0.04 mR/hr, 0.04 mR/hr and 1.5 mR/hr along the anterior, posterior, left, right and inferior directions, respectively. The mean of the measured exposure rate at 1 meter inferior to patient perineum was 1.1 mR/hr. The mean ratio of the measured versus calculated exposure rate was 0.74 (standard deviation = 0.23).

Conclusions: Our calculation technique is useful in determining in advance whether a patient may require hospitalization after his implant. The exposure rate at 1 meter inferior to patient perineum is a good indicator for determining whether the exposure rate along any direction might exceed the maximum allowed patient release exposure rate of 6 mR/hr.