ABSTRACT

In the practice of measuring the residual dose rate of radiation therapy patients undergoing hospitalization, radiation workers measure the patient's dose rate from a distance of 1 m while wearing radiation protection equipment. It is a fact that the dose rate decreases as the distance increases following the inverse square law. Based on the SRS 63 protocol and recommendations from ARPANSA (Australian Radiation Protection and Nuclear Safety Agency), the patient's dose rate was measured from a distance of 2-3 meters. Thus, based on the facts and the two sources, there is an opportunity for the dose of radiation workers to be optimized. The optimization was carried out by taking patient dose rate data from a distance of 2-3 m then converting it to dose rate data from a distance of 1 m according to US NRC data. The dose rate conversion uses the formula of the inverse relationship of the distance to the power of 1.5. This study investigates the inverse relationship of distance to the power of 1.5 in measuring the residual dose rate of radiation therapy patients at a distance variation of more than 1 m, namely the distance between 1-3 m and then compares the inverse formula of the power of 1.5 with the inverse square law formula. Dose rate data was taken from 25 radiation therapy patients who were undergoing hospitalization. From the dose rate data, a comparison graph of the residual dose rate curve of hospitalized patients with the theoretical curve was made and a table of residual dose rate data was converted. Qualitative analysis showed that the inversion formula of 1.5 power distance gave the best curve. Quantitative analysis shows that the 1.5 power distance inversion formula can provide a near-ideal mean value of 0.9966 with a least deviation of 0.13 when used to convert dose rates from a distance of 1.5-1.68 meters. The squared distance inversion formula gives an average value that is always far above the ideal value ranging from 1.21 to 1.36. So this formula always gives a predicted value that is overestimated from the actual value.

Keywords: Inverse Square Law, Distance inversion relationship to the power of 1.5