Purpose: In this study, the neutron measurements were performed in free in air and RW3 solid water phantom to estimate the secondary malignancy risk for three dimensional conformal radiotherapy (3D-CRT) and intensity modulated radiotherapy (IMRT) techniques in prostate cancer treatment.

Methods: Neutron dose were measured in 18 MV Elekta Synergy Platform and Varian Clinac linear accelerators by using bubble detector for personal neutron dosimetry (BD-PND). To determine the neutron equivalent dose in different depths and different distance from the edge of treatment field RW3 solid water phantom was used and organs location was defined in Alderson Rando phantom with respect to target (prostate) position in the treatment field. By using these data, we determined the neutron equivalent dose and effective dose for the standard prostate cancer patient treated with 3D-CRT and IMRT with 18 MV photon energy. The total dose was 70 Gy in 3D-CRT and 76 Gy in IMRT treatment in the current study. For both of these treatment techniques, we estimated the risk of secondary malignancies due to the neutron contamination by using the International Commission on Radiological Protection (ICRP) report 103.

Results: The equivalent dose and effective dose due the neutron contamination were considerably high in 18 MV IMRT technique. The secondary malignancy risk estimation for 3D-CRT and IMRT were found to be 0.44% and 1.15% for Elekta Synergy Platform linear accelerator, 0.92% and 2.38% for the Varian Clinac DHX High Performance linear accelerator, respectively.

Conclusions: Therefore, one should take care of the secondary malignancy risk in case of using 18 MV in IMRT applications.