A gating technique has been developed to reduce lung tumor motion effects in Positron Emission Tomography (PET) images. The Gated-PET images have then been registered with CT images for Radiotherapy. A commercial product, Real-Time Position Management (RPM) Respiratory Gating System, (Varian Medical Systems, Palo Alto, CA) is used to monitor the respiratory cycle. The RPM provides a trigger to the PET scanner (GE Medical Systems, Waukesha, WI) to initiate the gating cycle. Each respiratory cycle is divided into discrete bins, into which PET data are acquired. Motion-induced smearing has been studied on phantoms as a function of number of bins, lesion size, and smearing amplitude. The technique has been evaluated by comparing gated to non-gated images. Up to 60% reduction in the smearing effect has been measured for 10-bin gating technique in phantoms, at acceptable image noise level. Two patients have also been imaged using the gated and non-gated technique. The first showed 20% and the second 30% reduction in the lesion volume. The non-gated and gated PET images for one patient were registered with CT images and integrated into the clinical Treatment planning system. Preliminary analysis shows a reduction of 2% in lung NTCP (Lyman model) due to gating. Gated PET improves the image quality due to a reduction in the smearing effect caused by respiration. This allows a more accurate definition of the Gross Target Volume (GTV), and consequently allows a reduction in the Planning Target Volume (PTV) in radiotherapy planning, thereby sparing more normal tissues.