# AbstractID: 9448 Title: Model to account for organ deformation during respiration using the power law dependence of biological outcome on volume (mass)

**Purpose:** To investigate extending a model of biological outcome across the respiratory cycle to encompass the differences of dose distribution and tissue deformation at different respiratory phases during treatment delivery. **Method and Materials:** This problem is addressed using the equivalent uniform dose (EUD), calculated w.r.t. mass and volume in each voxel at different phases. An organ of interest is modeled as existing in two phases such that phase 1 has two and phase 2 has four voxels. The volume of each calculation voxel is taken to be a constant and total volume of the organ to change from one phase to the other due to deformation. Mass of each voxel changes within and in between the phases, whereas the total mass of the organ which is essentially the mass of cells within the organ, remains unchanged. The EUD and normal tissue complication probability (NTCP) in Lyman-Kutcher-Burman (LKB) model is calculated based on power law w.r.t mass and volume of voxels. **Results:** As the mass and dose of the voxels differ over time, $m_{eff}$, the effective mass irradiated to a reference dose ($d_{ref}$) at each phase differs and hence $M_{eff}$, the total effective mass also varies. Dose-dependent differences were observed in EUD calculated w.r.t. mass and volume. For dose variations analogous to that of a target, EUD calculated with volume and mass shows differences throughout the range of the volume-dependence parameter, a (=1/n). **Conclusion:** This work potentially takes dose distribution in all treated respiratory phases by considering fixed calculation voxels instead of a single phase or an ITV concept. EUD for a deforming organ is dependent on variations in the dose distribution across different respiratory phases. Dose distributions will be analyzed from treatment plans in phantom and patients using the proposed model in subsequent work.