Purpose: To develop a multi-criteria optimization framework for image guided radiotherapy decision processes.

Methods: An algorithm is proposed for a multi-criteria framework for the purpose of patient setup verification decision processes. Optimal patient setup shifts and rotations are not always straightforward, particularly for deformable or moving targets of the spine, abdomen, thorax, breast, head and neck and limbs that change as a result of treatment. The algorithm relies upon dosimetric constraints and objectives to aid in the patient setup and plan delivery such that the patient is positioned or the plan is optimized to maximize tumor dose coverage and minimize dose to organs at risk while allowing for daily clinical changes. A simple 1D model, a lung lesion are presented and a spine lesion.

Results: The algorithm delivers a multi-criteria optimization framework allowing for clinical decisions to accommodate patient target variation which make setup decisions less straightforward. With dosimetric considerations, optimal patient positions and plan parameters can be derived.

Conclusions: A multi-criteria framework is demonstrated to aid in the patient setup and determine the most appropriate daily position considering dosimetric goals. Future implementations include optimizations relying upon multiple plans, field parameters, and other dose metrics (TCP, NTCP, EUD, etc).