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Figure 1. Formal pathway for a) plan summation of a former and already created re-irradiation plan and b) optimisation of a re-irradiation plan

- **a) Assessing a re-irradiation plan**
  - Original dataset and dose distribution (conventional fractionation)
  - Deformable co-registration of original scan to new dataset
  - Deform original dose to new dataset based on above
  - Convert original co-registered dose distribution into BED or EQD2 using $\alpha/\beta$ ratio of 3Gy*
  - Summate to create combined plan in BED or EQD2
  - Convert combined plan into 5 fractions equivalent ($\alpha/\beta$=3Gy) to allow assessment of cumulative doses

- **b) Optimising a re-irradiation plan**
  - Re-irradiation dataset and dose distribution if already calculated (SABR, e.g. 5 fractions)
  - Visual check of co-registration
  - Convert new SABR dose distribution into BED or EQD2 using $\alpha/\beta$ ratio of 3Gy*
  - Convert original co-registered dose distribution into BED or EQD2 using $\alpha/\beta$ ratio of 3Gy* on dataset for re-irradiation
  - Convert to number of fractions desired for re-irradiation ($\alpha/\beta$=3Gy)
  - Optimise re-irradiation plan according to selected constraints using fractionation-corrected dose distribution as ‘base/bias’ dose (i.e. original dose considered by planning system in optimisation)

* A different $\alpha/\beta$ ratio (e.g. 2Gy for spinal cord) could also be used.
BED: biologically equivalent dose, EQD2: equivalent dose in 2Gy fractions, SABR: Stereotactic Ablative Radiotherapy