Purpose: The goal of this work was to use CBCT images taken at the time of treatment to derive PTV margin sizes that would account for inter and intra-fractional systematic and random errors associated with CTV position for patients treated prone on a new couch top belly board (CDR Systems Inc.).

Methods: Twenty-four patients (12 male and 12 female) were included in this study. CBCT data was acquired once every 5 fractions for a total of 5 images per patient. A 3D-3D bony anatomy auto-match was performed offline and the residual difference used as a surrogate for inter-fractional positional errors of the CTV. Systematic and random variations in CTV position were evaluated in a manner consistent with that of Stroom et al and used in PTVmargin = 1.96\(\frac{\sigma}{\sqrt{n}}\) + 0.7\(\frac{\sigma}{\sqrt{n}}\). The influence of hypothetical intra-fractional motion was included in the margin evaluation by introducing the following values: 1.0, 2.0 and 3.0mm.

Results: PTVmargin required to account for inter-fraction positional errors was found to be (AP, SI, LR) = (5.2 mm, 3.1 mm, 2.8 mm). If we assume any intra-fractional motion to be similar to that presented by Xu et al, then the required PTVmargin increases to (AP, SI, LR) = (7.0 mm, 5.0 mm, 5.0 mm). A 7.0 mm AP expansion is consistent with that quoted in the “Elective Clinical Target Volumes in Anorectal Cancer: An RTOG Consensus Contouring Atlas”, which recommends a margin between 7.0 and 10.0 mm. However, 7.0 mm is 2.0 mm greater than the 5.0 mm margin specified in the RTOG 0822 trial.

Conclusions: A PTVmargin expansion of (AP, SI, LR) = (7.0 mm, 5.0 mm, 5.0 mm) will account for inter and intra-fractional systematic and random errors associated with CTV position for patients treated prone on a new couch top belly board.