

Effect of the Spoiler Location on the Total Body Irritation Output

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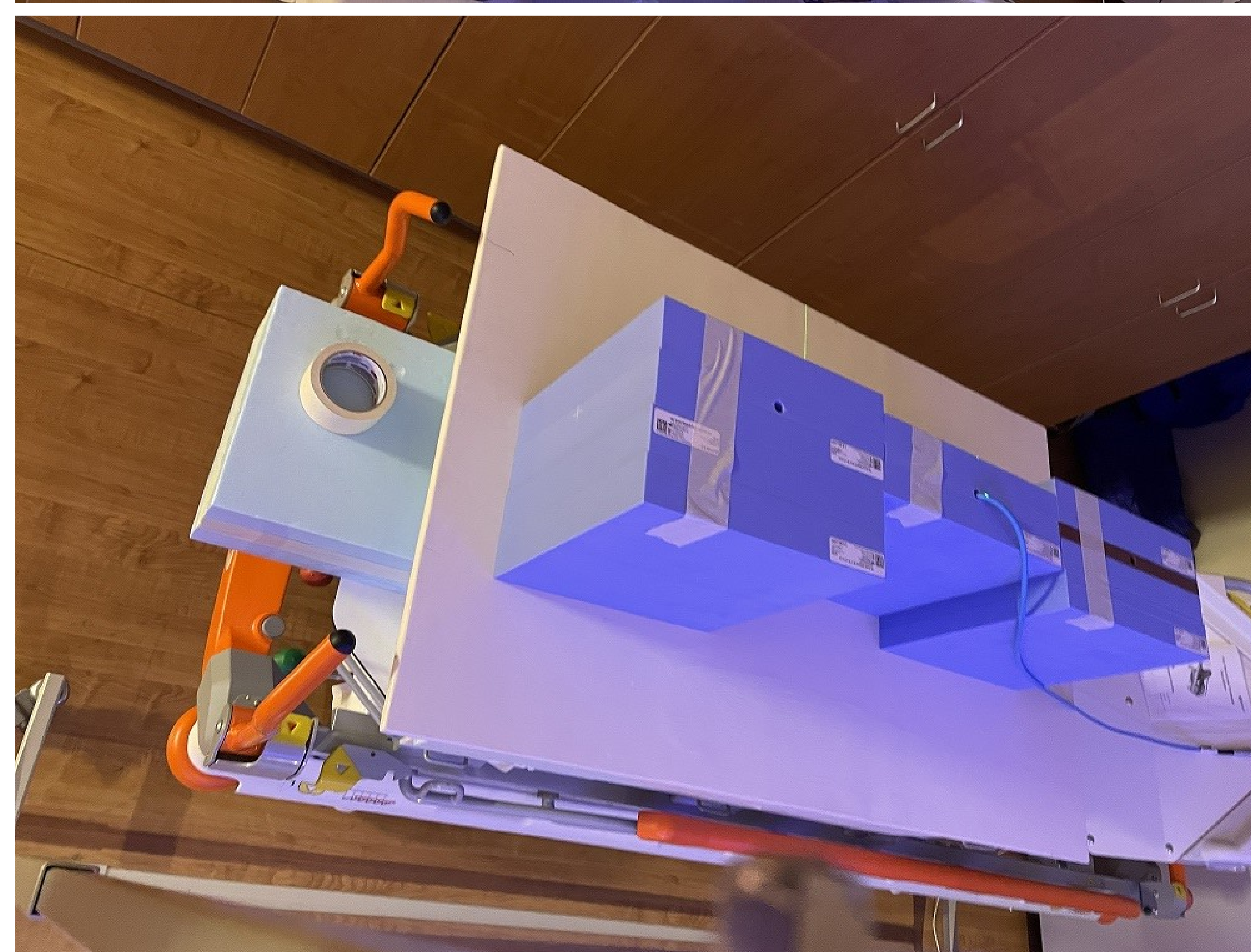
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Background & Objectives

- Total Body Irradiation (TBI) is a crucial component prior to bone marrow transplantation. A beam spoiler is typically used to increase the dose in the high-energy X-ray buildup region to 90% of prescribed dose. This is the first experiment to investigate the effect of spoiler location on TBI dose; it helps determine the optimal spoiler position and improve the consistency of output measurements.

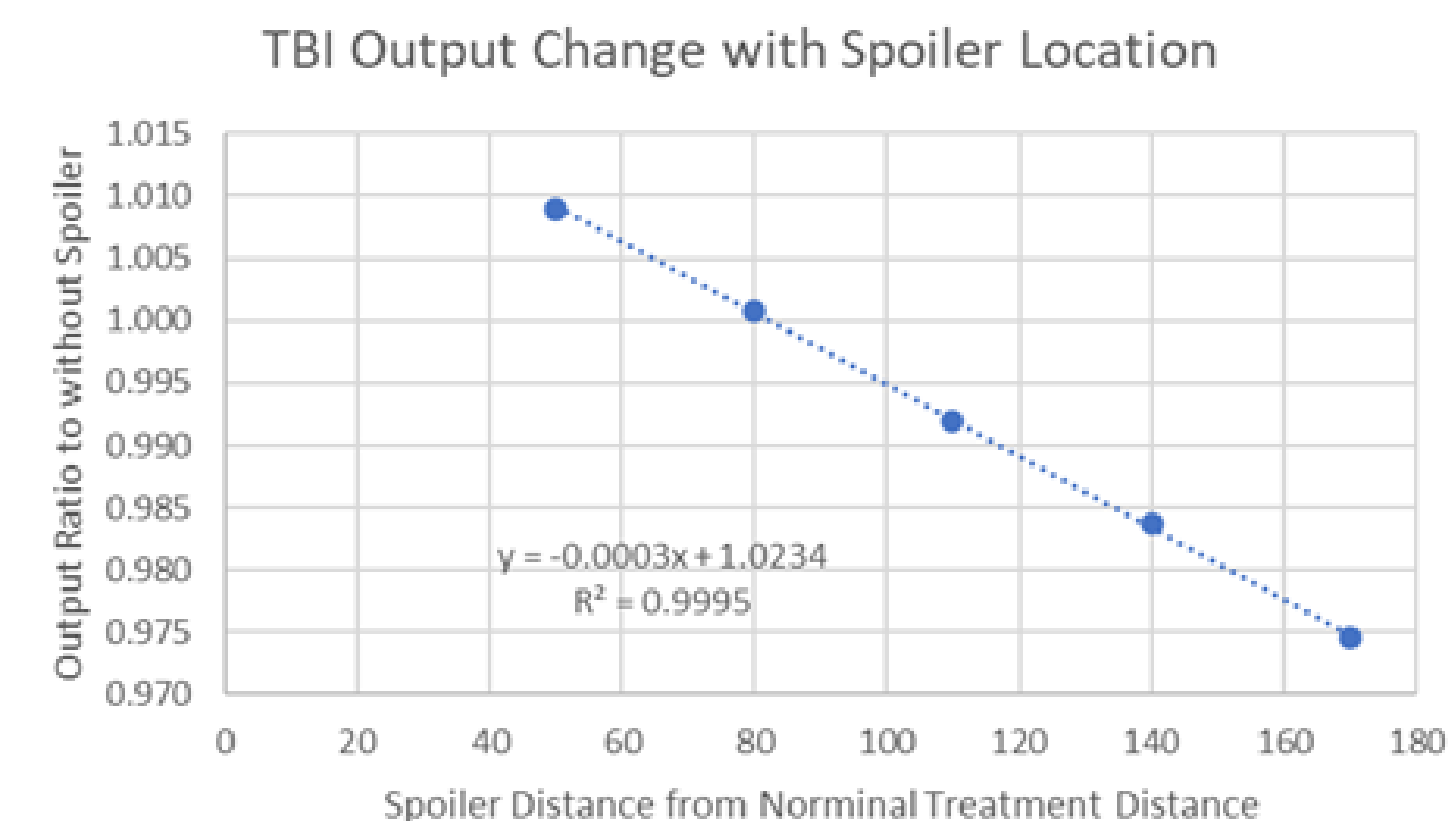
Methods

- TBI is implemented using a Varian TrueBeam with the patient in supine position at a nominal treatment distance of 350cm lateral to the target. The treatment parameters include 6MV beam energy, gantry angle of 90°, collimator angle of 0°, 40×40cm field size with MLC retracted. A special block tray is used for mounting compensators. An acrylic beam spoiler measuring 7×5ft with a thickness of 1cm is used.
- A PTW N30013 Farmer chamber and a Standard Imaging SuperMAX electrometer were used for output measurements. A SunNuclear solid water phantom was placed on a stretcher with the Farmer chamber insert oriented upward so that the chamber axis was perpendicular to the beam from the lateral direction. The chamber measurement depth was 1.5cm.



Results

- The spoiler distance was measured relative to TBI nominal treatment distance (350cm) and varied from 50cm to 150cm. The output ratio showed a linear relationship with spoiler distance, increasing from 0.975 at 150cm to 1.01 at 50cm; the closer the spoiler was to the patient, the higher the output.



Conclusion

- There are two effects of spoiler: attenuation effect that decreases dose and is dominant at large distances (150cm); and scatter effect that increases the shallow dose and is dominant at short distances (50cm). To achieve consistent dose, 50cm distance was selected, as it is constrained by minimum achievable distance of 48cm, determined by half the lateral width of the stretcher including the turning wheels.