

Implementation of a simless radiotherapy (SLRT) workflow in a multi centre environment for palliative radiotherapy treatment

Mark David Wanklyn¹

Guneet Kaur¹, James Hellyer¹, Alex Livingstone¹, Amelia Hollands¹, James O'Toole¹, Sally Evill¹, Gavin Tia¹, Thomas Eade² and Dasantha Jayamanne²

¹ GenesisCare

² GenesisCare, University of Sydney, Royal North Shore Hospital

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¹GenesisCare, Sydney, Australia

²University of Sydney, Sydney, Australia

³Royal North Shore Hospital, Sydney, Australia

Aim

To implement a large scale simless RT (SLRT) workflow in a private multicentre radiotherapy network based upon recommendations from a single site centre¹ to reduce the referral to treatment time for palliative patients.

Method

Work was done to determine the dosimetric accuracy of HU variation which may be found in diagnostic CT datasets. The suitability of the HU ranges corresponding to a 3% and 5% Dosimetric change were applied to a small sample population, and the effect of HU variation on overall dose distribution was studied.

Results

The HU range for typical body regions such as soft tissue, lung, cortical bone, and average bone density were determined to provide a 3% and 5% Dosimetric uncertainty as shown in Table 1.

| Material | Energy | ±3% relative dose difference | | | | ±5% relative dose difference | | | |
|--|--------|------------------------------|----|-------------|----|------------------------------|----|-------------|----|
| | | Upper bound | HU | Lower bound | HU | Upper bound | HU | Lower bound | HU |
| Water (1.0g/cm ³) | 6MV | 76 | | -132 | | 222 | | -182 | |
| | 6FFF | 105 | | -135 | | 240 | | -195 | |
| Lung (0.26g/cm ³) | 6MV | -715 | | -755 | | -700 | | -765 | |
| | 6FFF | -710 | | -759 | | -692 | | -772 | |
| Cortical Bone (1.85g/cm ³) | 6MV | 1520 | | 1050 | | 1710 | | 950 | |
| | 6FFF | 1500 | | 1090 | | 1660 | | 980 | |
| Average Bone (1.22g/cm ³) | 6MV | 475 | | 84 | | 595 | | 84 | |
| | 6FFF | 460 | | 84 | | 565 | | 84 | |

Table 1: HU values for different material types which correspond to a relative dose difference of ≤3% and ≤5% in block geometry for all depths up to 10cm

In slab geometry these changes accounted for a clinically insignificant dose deviation (<0.01Gy) at depths up to 10 cm.

In patient geometry, there was on average a 1.9% reduction in dose coverage to 95% of the target volume due to the difference in patient geometry and HU determination.

Conclusion

SLRT is a viable solution for palliative patients in a private multicentre radiotherapy network with the aim of reducing the overall referral to treatment time.

ⁱ S Wong, S Roderick, A Kejda, et al. Diagnostic CT enabled planning for palliative radiotherapy: removing the need for a planning CT Pract Radiat Oncol, 11 (2) (2020), pp. e146-e153