Optimization of CT scanning parameters and their effect on patient dose.

This research is being held as part of Mr Zarb’s Ph.D. studies at University College Dublin (UCD) under the supervision of: Dr. Louise Rainford (UCD), Dr. Mark Mc Entee (University of Sydney) and Dr. Paul Bezzina (UoM).

The rapid technological advancements and new imaging techniques in CT focused on the quest for increased image quality and increased diagnostic accuracy. Concerns on radiation dose might have been underrated in the process. Further research into the complex relationship between radiation dose, image quality and diagnostic accuracy has been recommended in several publications. Such research is needed to establish scientifically the minimum radiation dose necessary to provide adequate diagnosis in answer to the posed clinical question.

The 97/43/Euratom Directive highlights the 3 basic processes of radiation protection: Justification, Optimization and Diagnostic Reference Levels (DRLs) which have to be applied to the various CT units throughout the country.

The establishment of local DRLs in CT is important as DRLs provide a simple means of identifying situations where the levels of patient dose is unusually high and hence indicate when consideration of dose reducing measures (optimization) should be made with the impact of dose optimization being shown with changes in DRLs. However, the focus should not be on just minimizing the radiation dose but to which level can dose optimization be achieved without compromising diagnostic efficacy.

Studies performed to investigate the effect of measures in reducing the radiation dose and their effect on image quality have either tackled specific CT scan parameters individually or measured the effect on image quality by using phantoms. However phantom studies alone may not necessarily reflect the true quality characteristics of the CT image in representing anatomical structures.

This study aims to first identify current DRL values for Malta and then investigate optimization potential by evaluating the effects of optimized CT scan protocols based on combined changes of CT scan parameters. The effect of the combined changes of scan parameters on image quality and dose are gauged from phantom studies followed by animal studies before being implemented and evaluated in clinical practice.