Purpose: To review and compare different approaches to the problem of dosimetry for limited field-of-view (FOV) cone beam CT devices for dental and maxillofacial applications.

Methods: The determination of patient doses from specialized, cone-beam CT devices for dental and maxillofacial work requires medical physicists to re-evaluate their dosimetry methods. These devices work in cone-beam geometry, with an axial field dimension on the order of the lengths of the standard head CTDI phantom and pencil ionization chamber. They may also utilize less than 360 degree scans, resulting in asymmetrical radiation distributions. This operating regime is far from that for which conventional CT dosimetry was designed, and alternative approaches must be considered. The alternatives include extensions of conventional CT dosimetry currently used for large axial FOV scanners (e.g. the extended CTDI parameter (CTDI_e) for the Toshiba Aquillion One with 160 mm axial FOV) and the new method based on point dosimetry measurements recently formalized in AAPM Report TG-111. Conventional, modified-conventional, and TG-111 dosimetry measurements are used in two CT dose phantoms (adult head and pediatric head) to obtain dose indices for the Planmeca ProMax 3D Max dental CT scanner. Surface dose maps are generated using radiochromic film for correlation with the chamber dosimetry.

Results: Results for the three dosimetry approaches are compared for the specific case of the ProMax 3D Max scanner. Strengths and weaknesses of the three measurement paradigms for this type of application are compared.

Conclusions: The increasing availability of specialized scanners operating in full cone-beam mode will require the clinical medical physicist to be conversant with extensions to the CT dose index methodology suitable for this equipment.