New in NCRP 177

Cone-Beam Computed Tomography (CBCT)
Digital Imaging
Handheld Dental Imaging
62 Recommendations

Qualified Expert

Layout, shielding design, and verification
Implementation of QC program
Acceptance testing
Radiation protection survey and equipment performance evaluation (EPE)
EPEs at regular intervals

QC Intervals

Each dental facility should record and track indicators of patient dose, such as entrance air kerma and associated technique factors
X-Ray machine performance—not to exceed every 4 years. Metrics representing patient dose to be measured 2 years following EPE
CBCT— every two years, preferably annually

Digital Image Quality
**Employee Doses**

Students or candidates for licensure *shall not* perform x-ray exposures of humans

Personal dosimeters *should* be provided for any employee likely to receive in excess of 1 mSv/year

Personal dosimeters *shall* be provided for pregnant employees

For new or relocated equipment employees *should* be provided with personal dosimeters for one year

**Employee Doses**

Employees using handheld equipment *should* be provided personal dosimeters for one year

Employees *shall not* routinely restrain patients and *shall not* hold the image receptor

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**Patient Doses**

Diagnostic reference levels (DRLs)

Achievable doses (ADs)

Fluoroscopy *shall not* be used for static imaging

Image receptors of speeds slower than Speed Group E-F *shall not* be used

For intraoral–kilovoltage *shall not* be < 60 kVp and *should not* be > 80 kVp

Thyroid shields for all intraoral when it will not interfere with the examination

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**Cone-Beam Computed Tomography (CBCT)**

CBCT *shall* use the smallest field-of-view and lowest technique factors that provide the lowest dose commensurate with the clinical purpose

CBCT *shall not* be used for the purpose of producing simulated bitewing, panoramic or cephalometric images.

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**CBCT Recommendations**

CBCT examinations *shall not* be used as the primary or initial imaging modality when a lower dose alternative is adequate for the clinical purpose and *shall not* be used for routine or serial orthodontic imaging

CBCT *should* be used for cross-sectional imaging as an alternative to conventional CT when CBCT dose is lower
Suggested Bitewing Entrance Doses

<table>
<thead>
<tr>
<th>Detector Type</th>
<th>Suggested Entrance Dose (mGy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Speed Film</td>
<td>1.52–1.95</td>
</tr>
<tr>
<td>E-F- or F-Speed Film</td>
<td>0.87-1.09</td>
</tr>
<tr>
<td>Digital-PSF</td>
<td>0.52-1.04</td>
</tr>
<tr>
<td>Digital CMOS</td>
<td>0.44-0.87</td>
</tr>
<tr>
<td>Digital CCD</td>
<td>0.35-0.52</td>
</tr>
</tbody>
</table>

Rectangular Collimation Shall Be Used for Periapical and Bitewing Radiography

Exposed area three times greater with round collimation versus rectangular collimation.

Most Radiation Passes Through The Patient

Handheld Shielding

Operators of FDA-approved handheld x-ray units shall not be required to wear personal radiation protective garments

Assure Handheld Units Are FDA Cleared

Handheld Leakage Radiation

Leakage from back of x-ray unit
Summary

Selection criteria (have a good reason for acquiring the image)
Fastest available image receptor
Optimized exposure technical factors
Rectangular collimation with intraoral imaging
Thyroid shielding for all intraoral imaging and other examinations as appropriate

Smallest FOV and lowest exposure techniques commensurate with the diagnostic task in CBCT
Continuous QC programs for equipment, techniques, film processing, and image receptors
Up-to-date training for all personnel