Selection Criteria & Quality Assurance

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CONTENT

• Radiographic imaging for various dental conditions

• ALARP

• Concepts of Quality Assurance

• Quality Assurance Procedures

• Training Requirements.
Justification

- Fiercely debated
- Is the view clinically necessary
- Is there a net benefit from taking a radiograph
- Does the clinical examination warrant the x-ray
- Do the symptoms/history warrant an x-ray
- Every view must be justified and reasons recorded
Guidance

• Selection Criteria for UK FGDP’s


• Evidence based selection

• Insufficient data? Use best practice.

• Decision based on examination and history.
Caries

- If examination indicates x-ray required-
  View of choice is the bitewing

- Ideal for occlusal and interproximal caries

- Can detect moderate bone loss

- Can detect secondary caries

- Gives an indication of pulp chamber
Periodontology

• Usually diagnosed clinically
• Bitewings may be sufficient
• Radiographs help to monitor progress
• If pockets < 6mm- horizontal bitewing
• If pockets > 6mm- vertical bitewings
• If irregular or very deep p.a.’s may be needed
• If there is a widespread problem a pan-oral view backed by individual p.a.’s
Heavily Restored Dentition

- B.W.’s for posterior teeth

- Consider a p.a. if proposing a crown or bridge abutment

- DPT only if there are problems in several areas - not ideal
Endodontics

- Need for radiography usually based on history/examination and symptoms

- Requires serial radiography

- Best results using the paralleling technique
Pre-operative

Single periapical to show :-

- Size and shape of pulp chamber
- Size, number and shape of roots
- Morphology of canals
- Patency of canals
- Extent of any pathology/bone loss.
Operative

- A p.a. may be required to acquire the diagnostic working length.
- Apex locator may remove the need for a radiograph at this stage.
- A master cone or mid fill radiograph may be required if working with open apices.
- Special film holders available.
Post-operative

• Immediate p.a. to ensure obturation

• Follow up p.a. after 12 months (6/12 if open apex)

• Additional follow ups on signs /symptoms

• If treatment is successful after 4 yrs no further radiographs are required for follow up.
Trauma

• If minor- appropriate p.a. to check roots

• May need a parallax view

• If major consider immediate referral as each max/facs dept has its own protocol for views.

• An OPG/DPT would be appropriate
Orthodontics

- Views taken depend upon examination

- OPG/DPT shows the developing dentition BUT should not be used as a screening method

- Cephalometry used for skeletal relationships

- Occlusal or parallax views for unerupted teeth
Implantology

- Becoming increasingly common
- Radiographs required for bone availability and post op healing
- May require only a p.a. or may need pan-oral
- CT scans carry a high dose
- Cone beam volumetric tomography has a lower dose
- M.R.I. may be a possibility in the future.
Panoramic Radiography

• Area of concern as 7 fold increase in use in last 20 years

• Variable doses according to age/ type

• New machinery delivers a lower dose but still not as good as intra-oral views

• Must **NOT** be used as a screening tool

• Is appropriate if referring for G.A., in gross neglect, ortho or surgical planning
Panoramic cont........

- Some hospitals request a pan-oral view for pre-op assessment
- Intra-orphals are far better

- May be useful for special needs or where intra-oral views are not possible

- No use for TMJ problems
- No use for sinus problems.
Quality Assurance
WHO Definition

- An organised effort by the staff operating a facility to ensure that the diagnostic images produced by the facility are of a sufficiently high quality so that they consistently provide diagnostic information at the lowest possible cost and with the least possible exposure of the patient to radiation
In our Terms

• Good Diagnostic Quality
• Consistent results
• Lowest possible dose to patient
• Determine sources of error and correct
• Cost effective
Quality Control Measures

- Quality Assurance mandatory
Essential Reading

- 2001 Guidance notes for Dental Practitioners on the safe Use of X-ray Equipment
Aims of Q.A. Programme

- Produce consistently high quality diagnostic radiographs
- Reduce the number of repeat radiographs
- Determine sources of error and correct
- Increase efficiency
- Reduce costs
- Ensure Radiation doses to patients are as low as reasonably practicable (ALARP)
Maximise the process

- All exposures justified
- A.L.A.R.A.
- High Speed Film
- Beam aiming Devices.
- Correct maintenance of equipment.
- Correct instructions to patient
Quality Control Procedures

These relate to:-

• Image quality and film reject analysis
• Patient Dose and X-ray equipment
• Darkroom, image receptors and processing
• Working procedures
• Staff training and updating
• Audits.
Image Quality and Film Reject Analysis

Image quality assessment is an important test to the entire Q.A. programme and should include:

• Daily Comparison of Quality
• Formal analysis of film quality regularly
• Set performance targets
• Film reject analysis
Daily Comparison of Quality

- Select a high quality reference film
- Compare every film with reference
- Use suitable viewer
- Note any significant deterioration
- Investigate and correct any deterioration.
Formal Analysis of Quality

- Assess each radiograph taken according to the table below

<table>
<thead>
<tr>
<th>Rating</th>
<th>Quality</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excellent</td>
<td>No errors in exposure, positioning or processing</td>
</tr>
<tr>
<td>2</td>
<td>Diagnostically acceptable</td>
<td>Some errors in exposure, positioning or processing which do not detract from the diagnostic use of the radiograph</td>
</tr>
<tr>
<td>3</td>
<td>Unacceptable</td>
<td>Errors of exposure, positioning or processing which render the radiograph unacceptable</td>
</tr>
</tbody>
</table>
## Targets

Guidance notes recommend the following targets for radiography

**Percentage of Radiographs taken**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Target</th>
<th>Interim Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not less than 70%</td>
<td>Not less than 50%</td>
</tr>
<tr>
<td>2</td>
<td>Not greater than 20%</td>
<td>Not less than 40%</td>
</tr>
<tr>
<td>3</td>
<td>Not greater than 10%</td>
<td>Not greater than 10%</td>
</tr>
</tbody>
</table>
Film Reject Analysis

- Collect all grade 3 rejected film
- Identify that nature of the fault
- Analyse any pattern of fault
- Correct the cause of the fault
- Reassess on a recurring, regular basis
- Note the number of repeat radiographs
- Note number of rejects in comparison to total number
Nature of film errors

- Too dark
- Too pale
- Low or poor contrast
- Unsharp image
- Poor positioning
- Poor processing
- Presence of “foreign” bodies obscuring image
Patient Dose & X-ray Equipment

The main aim of Q.A. Is To Keep Radiation Exposure As Low As Reasonable Possible.

X-ray Equipment Must Comply With All Current Recommendations.

It is advisable for all dental nurses to familiarise themselves with equipment and the necessary supporting documentation.
Critical Examination

- This is the initial examination carried out by the installer

- A written Critical examination and report should be contained in the Radiation Protection File
Re-examination Report

- This is prepared after any relocation, repair or modification of any equipment that may have radiation protection implications
Day to Day Checks

• Correct functioning or warning lights

• Correct functioning of audible alarms

• Correct operation of safety devices

• Satisfactory performance of counterbalance for maintaining correct position of tubehead.
Image Receptors

- QA Requires written information on :-
- Film speed
- Expiry date
- Storage conditions
- Details of maintenance/cleaning of cassettes
- Details of maintenance/cleaning of digital receptors
Typical Requirements

• Ideal storage conditions:- cool, dry and away from all sources of ionizing radiation.

• Strict Stock control measures with records to ensure use before expiry date.

• Careful Handling
Cassettes

These require regular cleaning and maintenance.
• Clean with proprietary cleaner
• Regular checks for light tightness
• Regular checks for film/screen contact
Digital phosphor storage plates

These require:

- Regular cleaning
- Regular visual checks for scratches or other defects
Darkroom

• Q.A. should include instruction on all regular checks and how often. Results recorded in a log book.
• The important areas to include are

General Cleanliness
Light tightness
Safelights

Coin test
Processing

Quality assurance for Processing includes:-

Chemical Solutions

Processing equipment
Chemical Solutions

- Make up to manufacturers instructions
- Avoid contamination
- Fill fixer before developer
- Keep at correct temperature
- Monitor for deterioration (step wedge)
Step wedge

• Make a step wedge phantom using lead foil from inside film

• Radiograph wedge using set, known factors

• Process film in “fresh” solutions (standard)

• Repeat using same criteria each day

• Compare exposed films daily

• Record Results
Processing equipment

Manual processing requires the use of :-

• Accurate timers

• Thermometers

• Immersion Heater
Automatic processors

• Require regular replenishment

• Regular cleaning

• Maintenance of rollers

• Written procedures for cleaning and frequency

• Log of when cleaning and maintenance is carried out.
Local Rules

- Required by UK under I.R.R.1999 and should contain procedural and operational information essential to the safe use of equipment including guidance on exposure times
Staff Training

• All staff must have appropriate training for their role (I.R.M.E. 2000) and must undertake appropriate C.P.D.

• The QA programme should incorporate a register of all staff involved with any aspect of radiography and should include the following information:-
Staff Information

- Name
- Responsibility
- Date, nature and details of training received
- Recommended date for a review of training needs.
Audits

• Each procedure within QA requires a written record to be made by the responsible person at varying intervals.

• In addition the person responsible for overall QA should check the full programme at intervals not exceeding 12 months.

• This is an essential feature of demonstrating the effective implementation of the programme.
Clinical Audits

May include:-

• The QA programme and associated records

• Justification and authorisation of radiographs

• Appropriateness of investigation

• Clinical evaluation of radiographs