CLINICAL AUDIT OF DENTAL RADIOGRAPHY
DENTAL RADIOGRAPHIC AUDIT.

(50 Pairs of Bitewing radiographs, 25 Periapical radiographs and 10 OPG’s.)

INTRODUCTION

A clinical audit was carried out at the practice over a 6 month period to evaluate the use of all types of radiographs taken at the dental practice. All intra-oral radiographs were taken using the same Belmont Searcher DX-068 Wall mounted machine; utilising rectangular collimation and the Hawe-Neos system of beam aiming devices and film holders. Kodak Ultraspeed size 0 (22/35 mm) or size 2 (31/41 mm) were used, which are both speed D. All OPG radiographs were taken using a single Belmont X-Caliber machine in conjunction with Green sensitive film used in 2 green light-emitting screens.

The aims and objectives of the audit were to evaluate the use of radiographs in the diagnosis of dental and periodontal disease ensuring that any exposure to ionising radiation was of benefit to the patient in terms of their clinical management. There is a need in dentistry to minimise the radiation dosage to patients by eliminating:

a). Radiographs that are taken where the results are unlikely to affect patient management and/or prognosis.
b). Radiographs that are repeated unnecessarily.
c). Duplication of satisfactory radiographs that are carried out by mistake.
d). Avoidable lapses in quality assurance which impact on patient dose and/or care.

After a discussion with my facilitator, the above project was proposed and submitted in June of 2003, and subsequently approved. The various source materials used were SAMS, BDS Advice Sheet A11, Guidelines for radiology in private dental care, Guidance notes for Dental Practitioners on the safe use of Radiographic Equipment; IRRMER(2000), IRR(99) and NRPB regulations.

The Standard to be applied to this audit was higher than that given in the Guidelines on Radiology Standards in Primary Dental Care 1994, and is as set out in the following table.
<table>
<thead>
<tr>
<th>Rating Taken</th>
<th>Quality Criteria</th>
<th>Target % of Rads.</th>
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<tbody>
<tr>
<td>Good</td>
<td>No errors of exposure, positioning or processing.</td>
<td>Not less than 75%</td>
</tr>
<tr>
<td>Acceptable</td>
<td>Diagnostically acceptable: Some errors in exposure, positioning or processing which do not detract from the diagnostic use of the radiograph.</td>
<td>Not greater than 20%</td>
</tr>
<tr>
<td>Poor</td>
<td>Diagnostically unacceptable: Errors in exposure, positioning or processing which have rendered the radiograph unacceptable.</td>
<td>Not greater than 5%</td>
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In order to be able to place the radiographs taken into one of the above 3 classifications they first needed to be collated and assessed/analysed under each of the following criteria:-

A). **Patient information.** The audit needed to provide anonymity for the patients involved, but also required the means by which the information collected could be verified by a third party. This was achieved by means of a separate log book.

B). **Type of radiograph.** i.e. BW, PA or OPG.

C). **Date** on which the radiograph was taken

D). **Reason for the radiograph.** Mentioned in the clinical records.
   i.e. Routine Bw’s.
   - Endodontic treatment/diagnosis.
   - Monitoring/evaluation of periodontal condition or pathology.
   - Assistance in the diagnosis of symptoms.
   - Evaluation/diagnosis in situations that require surgical/extraction intervention.

E). Evidence of **Radiograph Checked**/reported on.
F). Correct Position of the beam/patient so that all types of radiographs produce correct images.
   Bw’s correctly centred with the target area taking in the distal area of the 4 to the mesial area of the 8.
   No coning off.
   No overlapping inter-proximally on Bw’s.
   Buccal and lingual cusps superimposed on Bw’s.
   Occlusal plane horizontal on Bw’s.
   Periodontal margins visible on Bw’s.
   Apices visible on PA’s.
   No geometric distortion on PA’S.
   No evidence of jewellery not being removed from patient’s before OPG radiographs,
   No shadows produced on radiographs as a result of patients not removing jewellery/glasses/hearing aids (especially relevant to OPG radiographs).
   No superimposition of skeletal spine on anterior teeth with OPG radiographs.

G). Contrast.
   Correct contrast achieved.
   No evidence of over or under exposure.

H). Processing free from errors/artefacts.
   No evidence of flatness caused by stale chemicals.
   An absence of scratches and blemishes caused by debris in the developer, or by imperfections in the roller system.
   No damage caused by films contacting each other in the processor, or sticking together by storing them together whilst still wet.

I). Sharpness.
   No loss of image quality resulting from movement of the patient or film during exposure.

J). Storage.
   Correctly stored and mounted.
   Correctly labelled and dated.

Overall Diagnostic Value.
All radiographs were assessed at the end of each day and were given a 1-3 rating in each of the categories already explained above.

1- Excellent.
2- Slight discrepancy but which does not detract from the ability to use the radiograph successfully.
3- Unacceptable, radiograph of no clinical use.

Any radiograph with a 3 rating in any of the categories was then placed in a Quality rating category of 3.
Any radiograph with a 2 rating, but no 3’s, was placed in a Quality rating category of 2. To be placed in the Quality rating of 1, the radiograph needed to have no 2 or 3 ratings in any category.

For this purpose spreadsheets were used. See attached information. (A-F Radiograph Data Sheets)

METHOD.

The practice has a policy of developing all radiographs at the time that they are taken using the automatic Velopex machine, which not only processes all the types of film used at practice X, but dries them too.

A log book was kept in the surgery during the time of this audit and each radiograph taken was given a letter and number that correlates to the letters and numbers on the spread sheets.

The log book also recorded the patient’s name and date that the radiograph(s) was taken on. This allowed the radiographs to be analysed at a later time, usually at the end of each day.

The results of the analysis of the radiographs was recorded on spreadsheets kept in the surgery which at the end of this audit were transferred to new ‘clean’ spreadsheets.

The results of these spreadsheets are analysed below:-

Data Analysis
100 bite-wing radiographs
Quality criteria 1 (good) 85 radiographs = 85%
Quality criteria 2 (acceptable) 14 radiographs = 14%
Quality criteria 3 (unacceptable/poor) 1 radiograph = 1%

25 periapical radiographs
Quality criteria 1 (good) 20 periapical radiographs = 80%
Quality criteria 2 (acceptable) 4 periapical radiographs = 16%
Quality criteria 3 (unacceptable/poor) 1 periapical radiograph = 4%

10 OPG radiographs
Quality criteria 1 (good) 9 OPG radiographs = 90%
Quality criteria 2 (acceptable) 1 OPG radiograph = 10%
Quality criteria 3 (unacceptable/poor) no OPG radiographs = 0%

As can be seen from the above results the said standard was surpassed in all categories. However because of the small number of radiographs in both the periapical group and the OPG group I felt that the number of radiographs in these groups was too small and the
results are not statistically satisfactory. If the Clinical Audit was carried out at the practice again on radiographs, I would increase these groups to at least 50 radiographs/group to give a much clearer idea of the quality of radiographs being produced.

For example if one OPG radiograph had fallen into category 3 (i.e. unacceptable standard) then this would have led to a 10% rating in this category, which in turn would have meant that there had been a failure to reach the ‘Said Standards’ in the Clinical Audit.

DISCUSSION OF RESULTS

I felt at the end of analysing the attached spreadsheets that because all said standards had been achieved that the audit had obviously been successful. Not only did I realise that the quality of the radiographs produced by myself were satisfactory, but subliminally I felt that my own standards had been raised by the Clinical Audit. This had occurred by providing me with time to read the various source materials (as stated in the introduction) but also by making me more aware of any errors that occurred in the taking of these radiographs and a willingness to succeed.

Detailed analysis of the spreadsheets shows that there were no processing errors whatsoever, which is due to my DSA changing/cleaning the Velopex as per my/manufacturers detailed instructions, every four weeks regardless of whether the chemicals seem to be ‘stale’ or not. Because of the practice policy of developing and checking radiographs when the patient is still in the surgery three categories always fell into standard 1. Namely ‘reason for taking’, ‘radiograph checked’, and ‘storage’. The only areas where faults were found were in ‘Positioning’ and ‘Sharpness’. Some of these errors were unavoidable as unfortunately not all patients comply to detailed instructions, and some of them have pronounced gag reflexes which unfortunately will always result in some errors being ‘achieved’.

The greatest problem that was identified was with those patients that have this pronounced gag reflex and in one of those situations; radiographs were not possible at all and were consequently not recorded on any result sheet. In some situations the Hawe-Neos periapical aiming device film holders proved impossible to use because of these gag reflexes. In these situations size 0 film had to be used with the patients co-operation. This sometimes resulted in a 2 rating, indicating that if aiming devices can be used then the quality of radiographs produced is significantly better.

The only other form of errors recorded were due to the incorrect positioning of the beam/radiographs by myself; or patient movement.
Time Table of Activity

1. Initial planning of Clinical Audit and discussion with facilitator (Dr. X). 1 hour.

2. Background reading of source of materials. 2½ hours.

3. Completion of application bid. 30 minutes.


5. Assessment of 135 radiographs over said period. 3½ hours.

6. Time taken to produce this typed Clinical Audit/Spreadsheet/Conclusion. 8 hours.

Total time 18½ hours

ACTION PLAN TO IMPLEMENT IMPROVEMENTS.

The main problems that were experienced can be seen from the discussion of the results above. The lack of problems with the processing proved that the training of the staff in this area is of a very satisfactory nature, and obviously needs to be maintained to this high standard. This would entail detailed and immediate training of any replacement staff to maintain the said standards.

It can also be implied that the use of Hawe-Neos film holders for bite-wing and periapical radiographs dramatically reduces the radiographs falling into quality category 2 or 3, and therefore there use is also essential whenever possible.

The audit has also made me investigate the possibility of purchasing the latest radiovisiography systems for both intra-oral radiographs and OPG’s.

Set date for Audit Revisit December 2010.