

Clinical governance in action

A retrospective audit of radiograph quality: completing the audit cycle

Robert J Emanuel BDS MSc FDS RCSEd
Head of Clinical Services

Nusrat Hussain BDS
Dental Practitioner

Martin O'Sullivan BDS MFGDP MFDS MBA
Former Senior Dental Officer for Special Needs

West Sussex Community Personal Dental Services, Haywards Heath, West Sussex, UK

ABSTRACT

The audit aimed to investigate improvement in the clinical and processing quality of periapical and bitewing radiographs taken within the service, when compared to the original audit. One-hundred and sixty-three radiographs taken during June 2004 were obtained from 11 clinics and 17 dentists. Each clinician returned a questionnaire. Three authors reviewed the radiographs, using set guidelines produced by Faculty of General Dental Practitioners

(FGDP). Of the 163 radiographs taken, 120 (74%) scored 1, 33 (20%) scored 2 and 10 (6%) scored 3. Substantial improvement in quality of radiographs was observed with 94% of the films meeting the FGDP criteria as against 71% in the original audit. The improvement in quality may be due to dentists being more aware of quality issues

Keywords: audit, dental services, radiographs

Introduction

The role of audit is an essential part of modern clinical practice¹ and is now a mandatory part of NHS dentistry, with each primary care NHS dentist being required to complete 15 hours of audit or peer review in a three-year cycle. Audit is also a major part of dental radiology, with the regulations stating the necessity for sites with radiographic equipment to have in place quality assurance programmes.^{2,3}

West Sussex Community Personal Dental Services (WSCPDS) carried out a retrospective audit in November 2001.⁴ This audit reported on the quality of radiographs within the service and looked specifically at the areas of:

- 1 clinical image quality
- 2 processing quality.

The views examined were bitewing radiographs and intraoral periapical radiographs. Bitewings are a radiograph usually taken in pairs (left and right), which

show the crowns of the upper and lower posterior teeth and are used routinely to detect dental caries and periodontal disease. Periapical radiographs show the entire crown and root of the tooth being examined, and are used to detect abscesses and root anatomy as well as dental caries and periodontal disease.

The audit showed that 71% of the studied radiographs were of satisfactory quality. This compared well with other local audits, but fell short of the standard of 90% set by the Faculty of General Dental Practitioners (FGDP).^{5,6} Some decrease in quality, however, was expected and reported due to the fact that WSCPDS provides oral health care for two different patient groups. Patients in areas where access is poor can receive care from the general dental side of the service (personal dental services or PDS). The community dental service (CDS) supplies a specialist service to groups of individuals with special dental, medical or social needs. It was the special needs patients seen by the

CDS which added to the difficulty of taking quality radiographs.

The audit also showed that only 67% of the radiographs were taken using beam aiming devices or positioners (a device used to hold the film in an accurate relation to the X-ray beam).

Part of the audit cycle is to repeat the process after a period of time to monitor any changes in practice and quality of care. After the original audit was completed, a number of recommendations were suggested to the clinics which took part, and therefore an improvement in quality was expected to be seen. These recommendations included encouraging the use of positioners.

A number of clinics had now started using digital radiography and it was hoped to examine whether such a development would affect quality.

Aims

- 1 To investigate the clinical and processing quality of periapical and bitewing radiographs taken within the service.
- 2 To investigate whether an improvement in quality based on these criteria was recorded in a repeat of the original audit.

Objectives

To improve the overall quality of radiographs taken by greater compliance with the Ionising Radiation Regulations 1999 and the Ionising Radiation (Medical Exposure) Regulations 2000, by:^{2,3}

- highlighting any potential problems involving quality issues within the service
- determining any correlation between good-quality views and the use of positioners
- Determining any decrease in quality which may be in part explained by dealing with patients with special needs.

Standards

Standards were based on the *Guidelines on Radiology Standards for Primary Dental Care* produced by the Faculty of General Dental Practice (FGDP); 90% of the radiographs should be of diagnostically acceptable standard or above.⁶ The radiographs were examined using the following three-point quality scale:

- *score 1 or excellent*: no errors noticeable
- *score 2 or diagnostically acceptable*: some minor errors but nothing which detracts from the diagnostic value of the film
- *score 3 or unacceptable*: more major errors which have the effect of the film being diagnostically unusable.

Seventy percent of radiographs should score 1, 20% score 2 and no more than 10% score 3.

The 90% standard is based on an amalgamation of radiographs scoring 1 and 2.

Methods

As the methods of the audit had been tried and tested previously, they were repeated with very little adjustment.

Each clinician was asked to provide ten sets of patient radiographs taken during June 2004 for every clinic they worked at. The set of radiographs consisted of all the radiographs taken for the patient chosen during June 2004. If that clinician had taken radiographs on more than ten patients for that month, ten sets were randomly chosen.

Each clinician at each clinic was supplied with an instruction sheet and questionnaire, which was partly filled in (difficulties encountered, type of developer and whether positioner used) and returned with the ten sets of radiographs for examination.

In contrast to the first audit the radiographs were viewed by all three authors as compared to the solo author the first time round.

The criteria examined were:

- no interproximal overlap (overlap occurs when the beam of the X-ray is not at right-angles to the teeth, therefore distorting the image)
- for intraoral periapical radiographs, at least 2 mm of investing bone beyond the tip of the root should be visible (this allows diagnosis of any bony pathology possibly present due to diseased pulp tissue)
- distortion (should be zero or very minimal)
- whether positioners were used
- processing quality of radiograph (should have good density and contrast with no processing artefacts)
- type of processor (automatic/manual (chemical) or digital)
- any difficulties noted when taking the radiographs.

After examination each radiograph was assigned a score of 1, 2 or 3 as discussed in the section on standards.

Results

The total number of radiographs sampled was 163. These were supplied by 11 clinics and 17 dentists. One dentist at one of the clinics took no radiographs for that time period and two questionnaires were not returned.

One-hundred and thirteen (69%) radiographs were bitewings, while the other 50 (31%) were periapical views.

Of the radiographs taken, 151 (93%) had no overlap, 42 (84% of the periapical) had visible apices, and 153 (94%) had little or no distortion.

Positioners were used in 107 (66%) of the cases. An automatic developer was used in 160 (98%) of the cases; the remaining three (2%) cases were digital radiographs. One-hundred and forty-three (88%) views were processed to a high standard. While it was felt that 17 (10%) of the developed radiographs were below standard, this had a lesser effect when considering the FGDP standard with some of the affected views being scored as 2 rather than 3.

Difficulties were noted in 67 (41%) of the cases submitted.

Applying the FGDP standards to the films, 120 (74%) scored 1, 33 (20%) scored 2 and 10 (6%) scored 3. This gave a combined score of excellent (1) or adequate (2) radiographs of 153 (94%).

Discussion

When the audit was carried out previously, the percentage of films without any major errors was 71%.⁴ When re-audited the percentage of films meeting this criteria rose to 94%. This is compatible with the standards set by the FGDP as mentioned earlier, and would suggest a substantial improvement in radiograph quality. Interestingly the improvement in quality would appear not to have been caused by an increased use of the positioners by dentists, as the percentage of films taken with positioners dipped slightly from 67% to 66%.

Conversely, of the ten films which were of poor quality, seven were taken without positioners and of those, five were taken on patients with poor ability to cope as recorded on the 'difficulties?' part of the questionnaire. It is often very difficult to use positioners in young children, patients with behavioural problems, or other medical/physical problems, as the size of the instrument placed into the mouth is quite large and certainly more intrusive than the traditional method of holding the film against the tooth with the finger. Of the 56 films taken without positioners, 39 were accompanied by a statement of 'child patient' in the 'difficulties?' column (however the majority of these were still of good quality).

It is likely therefore that the improvement in quality may possibly be due to the dentists being more aware of quality issues, and taking extra care in situations where it is not possible to use positioners.

The quality of processing, although only 88%, was deemed to have had less of an impact on overall quality when assessed against the FGDP criteria, with less than ideal processing reducing a film's score from 1 to 2 in many cases. The vast majority were taken as plain films and developed in automatic processors, with only three being taken digitally. The three digital views all scored 1 on the FGDP scale. (The small number of digital radiographs taken would make it very difficult to assess whether their use has a positive or negative effect on quality.)

Due to the high numbers of special needs and paediatric patients seen by WSCPDS, it is perhaps unlikely there will be a big improvement in the overall quality of radiographs taken when the whole audit process is repeated in the future. However, there may be some room for improvement in processing quality and the increased use of positioners, which should increase the predictability of radiographs taken at any given time.

These results were disseminated to the clinics that took part, and will be discussed as a peer review topic to emphasise the issues at a future dentist peer review meeting.

Conclusion

The overall standard of intraoral radiographs taken within WSCPDS was good and had markedly improved since the original audit.

By circulating the results and discussing them at peer review, quality issues will be reinforced, and re-auditing in the future will ensure the high standards obtained are maintained.

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CONFLICTS OF INTEREST

None.

ADDRESS FOR CORRESPONDENCE

Dr Rob Emanuel, West Sussex Community Personal Dental Services, Sheencroft, 10–12 Church Road, Haywards Heath, West Sussex RH16 3SN, UK. Tel: +44 (0)1444 475790; fax: +44 (0)1444 475758; email: rob.emanuel@mspct.nhs.uk

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