

## Clinical governance in action

# A retrospective audit on the quality of periapical and bitewing radiographs taken in a primary care setting

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### ABSTRACT

This audit studied the quality of radiographs taken throughout the countywide West Sussex Community Personal Dental Services (WSCPDS). It investigated whether quality was influenced by factors such as the use of radiograph positioners, automatic developers and patient co-operation problems. Many of the patients were individuals with special needs (part of the remit of the community dental services is to provide dental care for such patients).

The results showed that of the 112 radiographs taken, 71% had no positioning or developing errors. The majority of errors were due to positioning problems rather than developing, therefore use of positioners should be strongly encouraged.

**Keywords:** dental services, radiographs, special needs patients

## Introduction

The role of quality assurance is an essential part of good clinical care. One aspect of this is keeping patient records that include radiographs.<sup>1</sup>

It is essential that radiographs are taken only for diagnostic purposes. This maintains the principles of ALARA (As Low As Reasonably Achievable) and therefore reduce the total amount of radiation attributable from dental sources.<sup>2</sup> Also it is necessary that views are of a high quality so that the appropriate information can be drawn from them.

Both retrospective and prospective audits on radiograph quality have been reported in the literature.<sup>3-5</sup> Although the methods of the audits varied, the general issues addressed have been:

- clinical image quality, where the radiograph contains all the information needed to aid clinical diagnosis
- processing quality
- record keeping, including mounting, labelling and reporting information in the notes.

In an audit carried out locally by the South Thames (West) Regional Community Dental Audit Group into bitewing quality, they reported '50% of the clinical films were of inadequate clinical and/or processing standards'.<sup>6</sup> This would suggest that radiograph quality is an area of dental practice where quality could be improved.

West Sussex Community Personal Dental Services (WSCPDS) provides dental care for individuals with special needs (community dental services) and those who have difficulty in finding NHS care (personal dental services). Within the community setting, it is likely that difficulties encountered with special needs patients may have an impact (negative) on radiograph quality. Specifically, patients with severe learning disabilities or severe physical handicap may not be able to tolerate the presence of the radiographic film and the plastic positioner (a device used to hold the film in an accurate relation to the x-ray beam) in their mouths. Both items combined can be quite bulky and in these cases where co-operation is insufficient, it is important for the clinician to record any difficulties in the notes.

As an organisation, the benefits of using positioners were discussed firstly, prior to the audit, at

our clinical governance group, and then in-house training was organised. As a result of this process all clinics were supplied with radiograph positioners. Such action would hopefully impact positively on the results.

## Aims

To investigate the clinical and processing quality of periapical and bitewing radiographs taken within the service.

## Objectives

To improve the overall quality of radiographs taken, by greater compliance with *The Ionising Radiations Regulations 1999* and *The Ionising Radiation (Medical Exposure) Regulations 2000* by:<sup>7,8</sup>

- highlighting any potential problems involving quality issues within the service
- determining any correlation between good quality views and the use of positioners.

## Standards

These standards are based on those described in the *Self-Assessment Manual of Standards: clinical standards in general dental practice* (SAMS).<sup>9</sup>

Based on the *Guidelines on Radiology Standards for Primary Care*, 90% of the radiographs should be of diagnostically acceptable standard or above (but may include minor errors which don't alter diagnostic value).<sup>10</sup>

Each radiograph should have the following features:

- positioning:
  - target area fully visible
  - positioners used where possible to avoid distortion of the image (use of positioner not always possible due to level of patient co-operation)
  - no interproximal overlapping (this occurs when the beam of x-rays is at an incorrect angle to the teeth, thereby distorting the image)
  - for intra-oral periapical radiographs (IOPAs), the periapical bone must be visible for at least 2 mm beneath the tip of the root. In cases where there is a radiolucency, the radiograph should show 2 mm beyond the pathology
- processing:
  - good density and contrast
  - no processing artefacts.

## Methods

A pilot study of ten sets of patient radiographs was carried out to check methodology, which was found to be sound. Data collection was then carried out.

Each clinic was asked to provide ten sets of radiographs taken from a designated time period prior to the audit (November 2001). The set of radiographs for each patient consisted of all radiographs taken for that patient during November 2001. In clinics where more than ten sets of radiographs were taken, ten sets were chosen randomly from the ones available.

Each clinic was supplied with instructions and questionnaires on which the clinician at that site could state whether positioners and auto developers were used for that case. Also any problems encountered while taking the views were to be noted, e.g. poor compliance etc. The films were all examined by one person only (the author) to eliminate inter-examiner variability.

The criteria looked at by the examiner are listed below and the results were recorded on a specially formulated data collection sheet:

- interdental overlap
- apices visible on IOPAs (yes/no)
- distortion (none or small amount/large amount)
- positioners used (yes/no)
- processing quality (adequate with no artefacts, of good contrast and detail/inadequate with artefacts, poor contrast and detail)
- type of developer used (manual/automatic)
- any difficulties noted.

## Results

The total number of clinics that took part in the audit was ten, and the total number of dentists was 14 (some dentists filled in more than one questionnaire as they worked in more than one clinic). In four of the sites during that period, no radiographs were taken. There were, therefore, ten sets of radiographs to examine.

There were 112 radiographs taken altogether. Fifty-six of the radiographs were bitewings which are taken in pairs and are mainly used to check for hidden dental caries. The other 56 were IOPAs which are used to mainly to assess root and bone health. Overall of the 112 views, 80 (71%) were deemed to be positioned and developed to an adequate standard whilst 32 were deemed to have errors.

Of the errors incurred, nine showed overlapping, ten of the IOPAs failed to show the apex of the root and 13 of the radiographs showed distortion.

Positioners were used for 75 of the radiographs taken (67%). For these radiographs, 14 of the views showed errors. For the 37 radiographs where no positioner was used, 13 of the views showed errors. The ratio of positioning error when using positioners was approximately 1 in 5, while when not using positioners the error rate was approximately 1 in 3. When tested statistically (chi-square), the difference between the error rate for views taken with or without positioners was found to be not significant ( $P > 0.05$ ).

Six radiographs were found to be of insufficient quality when difficulties with patient co-operation were documented.

One-hundred and eight (96%) of the radiographs were developed in automatic developers and 103 (92%) were deemed to be adequately developed.

## Discussion

The result of 71% of all views being free of major positioning errors compares well with other local audits, but falls short of the Faculty of General Dental Practitioners recommendations of 90%.<sup>6,10</sup> Ninety-two per cent of the radiographs being adequately developed met the standard set.

The higher failure rate of those radiographs taken without positioners would support the use of positioners where possible. Although the difference in results was not statistically significant, there did appear to be a trend of more errors when positioners were not used.

Of the 37 views taken without positioners, only seven came accompanied with an additional note explaining difficulty encountered due to patient's special needs or poor co-operation. This would suggest that in most cases the decision whether to use positioners is influenced more by clinical choice than by patient difficulty. The overall developing quality was good due to the majority use of auto developers. As there were insufficient numbers of radiographs developed manually, any differences between the two techniques would be hard to notice.

As expected, a number of views were taken with difficulty in patient co-operation. If these views were discounted the overall percentage of satisfactory radiographs would have been 75%.

There was no area of quality which fared a lot worse than any other, but further increase in the use of positioners would have the likely effect of reducing the number of missed apices on periapical views.

Since this part of the audit has been completed, the results have been circulated to all the clinics and clinicians who took part. This dissemination

of information allows individual practitioners to compare their methods of current practice with their colleagues who also work within the service. The use of positioners, which did appear to be an area where some improvement could be made, has since been discussed further at one of the regular peer review meetings held by the clinicians within the service. The audit is to be repeated in the near future to assess whether there has been a further increase in the use of positioners and whether this leads to an expected improvement in radiograph quality.

## Conclusion

The overall standard of radiographs taken by WSCPDS was satisfactory when compared with other local audits but still needed to be improved to reach the gold standard.

Carrying out the audit and circulating its results will help raise awareness of quality issues. To see whether there is any improvement, the audit needs to be followed up in time.

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