South Tyneside and Sunderland
NHS Foundation Trust

Proposed standards for interpreting and reporting of Orthopantomograms in the acute setting at Sunderland Royal Hospital.

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Contents

Introduction

At Sunderland Royal Hospital (SRH), orthopantomograms (OPGs) taken in the Emergency department (ED) are frequently reported by radiology staff. The most common indications for an OPG are trauma and infection. They are also occasionally used as part of the diagnostic work up in head and neck cancer patients who present to the ED.

When an OPG is taken in the acute setting at SRH, the reporting of OPGs is not solely designated to head and neck radiologists. Most commonly it is an advanced practitioner or consultant radiologists who are not head & neck specialists. There are no dentally qualified 'dentomaxillofacial' radiology staff as SRH is a district general hospital with no attached dental hospital. If an OPG is taken in the emergency department and the patient is not referred to OMFS, it is at the point of reporting that missed diagnoses can be identified. OPG reports represent a useful commodity to the ED consultants who review x-rays of discharged patients to ensure that pathology has not been missed. However they are not used by OMFS staff who are as a majority dentally qualified, and thus are trained to both interpret and report dental radiographs.

Based on a number of clinical experiences, it was noted that many OPG reports were short, incomplete, inaccurate and late. The reports often detailed different aspects of an OPG, and so it was clear that a standard format was not being followed. Inadequate reporting represents a risk to patient safety, and creates significant medico-legal grey areas for involved staff. Additionally, significant time and money is spent on the reports that could be saved. Due to a backlog of reporting and busy emergency departments in many trusts, locum radiologists are commonly employed, creating a significant cost burden.

Current guidelines

A search of all major dental bodies and societies for gold standard guidance on how to report OPGs revealed very little. Two loosely relevant current guidelines could be extrapolated for comparison. However, these were aimed specifically at a primary care dental environment rather than an emergency department/ maxillofacial one.

1. FGDP: Selection Criteria for Dental Radiography (2018)[1]
2. FGDP: Clinical Examination and Record keeping (2016)[2]

1. FGDP: Selection Criteria for Dental Radiography (2018)

These guidelines are aimed at improving standards in primary care, and have been created by the faculty of general dental practitioners. The remit was as follows:

"To produce selection criteria which are specific to dental radiography. these criteria should encompass all aspects of radiological practice in dentistry, with a focus on primary dental care"

Section 2.2 is of most relevance and concerns 'The Use of Panoramic Radiography'

In 2.2.5 regarding trauma the guidelines state that: '*a panoramic radiograph is the first-choice imaging for mandibular fractures. Although if there is a clinical evidence of a bone fracture, it is more appropriate to refer the patient for radiographical examination at the hospital*.'

Whilst the above is entirely appropriate, it highlights that these guidelines do not aim to provide guidance on reporting orthopantomograms, particularly those taken in secondary care.

2. Clinical examination and Record Keeping (2016)

These guidelines are set out as 'aspirational guidance' rather than to be interpreted as 'essential requirements'. They set out to describe what constitutes dental records and what encompasses a full examination.

Of relevance, there exists a discussion within the guidelines as to what information may be gathered from a radiograph. This is currently the closest that exists to guidance on reporting.

It states that in order to plan treatment, information that the practitioner will require may include:

• Presence of caries	• Morphology of pulp chamber
• Condition of existing restorations	• Signs of periapical pathology
• Alveolar bone levels	• Position of unerupted teeth or retained roots
• Root morphology	• Other pathology of the jaws

It is clear that not all of the detail above is not fully relevant to a secondary care acute environment. For example the morphology of pulp chamber is unlikely to signficantly affect the treatment plan in a maxillofacial environment. However much of the other information could be of use, if considered to a reasonable level. For example mild periodontal disease and carious lesions restricted to enamel

are unlikely to be useful in the acute setting. However large carious lesions into the pulp chamber and significant periodontal disease capable of causing infection may be. Consequently, even if these current guidelines were used as a template it is likely they would be difficult to extrapolate on a reliable and reproducible level.

Additionally, as the radiology staff at Sunderland Royal and many other district general hospital are not dentally qualified, the need to assess niche dental pathology is unfair on them, inappropriate, and medico-legally questionable.

Overall the point is not to illustrate the inadequacy of the guidelines, as they are fit to serve the purpose for which they were designed. However they help illustrate that ultimately no appropriate guidance has ever been developed. Consequently, without such guidance it is unfair to expect radiologists and associated practitioners to reach a reproducible standard.

At Sunderland Royal Hospital, it was felt that it would be difficult to address the failings of the current radiograph reporting system without proposing an alternative solution. Due to the lack of evidence base available it seemed the most effective way to achieve this outcome would be to develop our own guidelines. The aim of these guidelines would be to form a framework that could be considered nationally. Ideally this would promote accuracy, reliability and patient safety, whilst also reducing the risk of medico-legal costs and complaints.

Methodology

Primary aims

In total, 104 OPGs taken over a 2 month period from September to October 2020 were reported by the aforementioned radiology staff. Each of these OPGs was then assessed by 2 OMFS Staff Members (1 dentally qualified medical student & 1 dual-qualified Foundation Year 2 Doctor).

The radiographs were selected by using the filter system on PACS for 'orthopantomogram' within the timeframe specified. They were then recorded on an excel spreadsheet (Appendix A).

The reports were analysed to a 'dental' gold standard, that considered all of the above features from the 'Clinical examination and Record Keeping' guidelines (Table x). The purpose of this was to illustrate and prove numerically that currently guidelines are not suitable and cannot be reasonably applied as discussed above.

Following this, the radiograph reports were reviewed again. This time they were compared against a proposition for what would be more reasonable to expect from a secondary care report. The data collection is seen in Appendix A. This proposition formed what would be the basis for the guidelines and the overall purpose of this project.

The full constituents of this proposition can be reviewed on page 9 under 'Proposed Guidelines', whilst the relevant subsection of this: 'Requirements on reporting and their justification' is listed below.

Requirements on reporting & their justification

- Mandibular fractures and dislocations
    - Symphyseal, parasymphyseal, body, angle, condylar & maxillary.
- Dento-alveolar trauma
    - Crown, root, crown-root, complicated, luxations, avulsions.
- Infection
    - Grossly carious teeth and/or significant periapical pathology
- Impaction
    - Impacted teeth, unerupted teeth, retained roots
- Large bony lesions
    - radio-opacities and radio-lucencies that are not related to infection.
- TMJ
    - Asymmetry, erosion, flattening

Secondary aims

Another aim of the project; less related to these guidelines, was to understand the cost of reporting OPGs in the trust, and hence the grade of reporter was logged in data collection.

Furthermore, regardless of the lack of standards, staff had noticed some more obvious errors in reporting that would benefit from review, alongside a delay in the time reporting. To date there had been no audit of the quality of orthopantomogram reports. Therefore the results from this project could also be used to feedback to the radiology department on commonly missed areas of pathology or recurring themes, and to provide data on average reporting times.

The data on the aforementioned reports and usage was analysed and audited (page 4), with a view to understanding the main areas of inadequacy as shown in the results section.

Results

Overall, the mean time taken to report OPGs was 5 days. The range was between 0 and 35 days. This confirms that the use of the reports could only really be used retrospectively to assess for missed pathology.

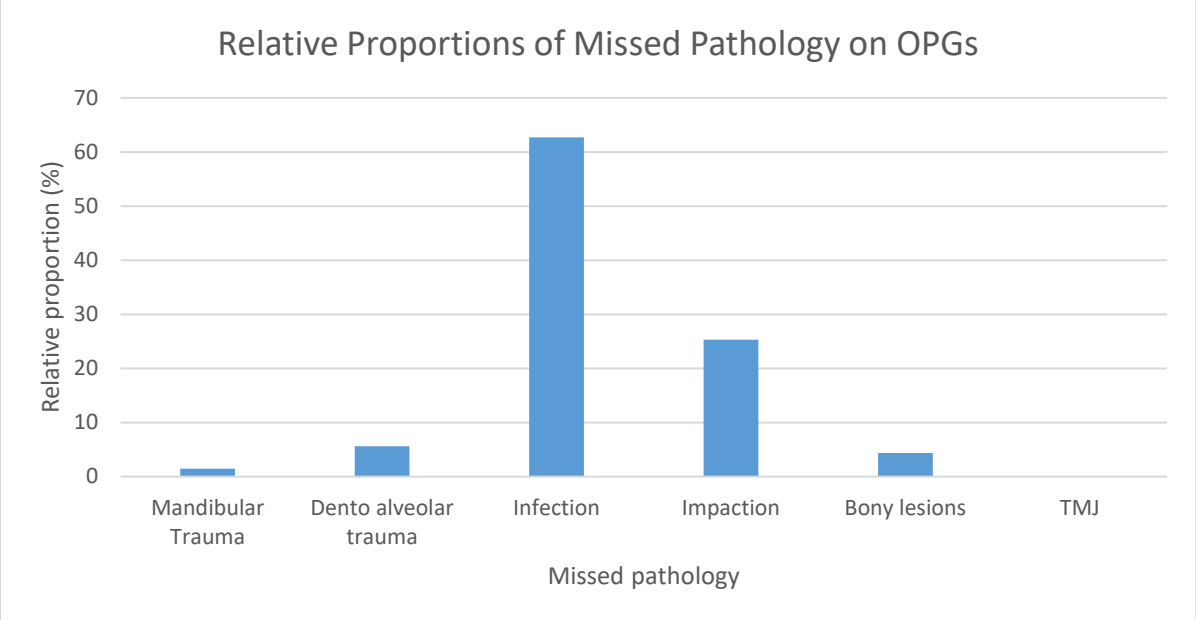
59% of reports were completed by a consultant, and the remaining 41% was completed by advanced practitioners. This therefore illustrates the high cost of orthopantomograms in terms of consultant hours.

When radiographs were compared against the closest equivalent to a dental gold standard (CERK, 2016), then a striking 97% of reports would be considered to be inadequate.

These results could lead to the conclusion that radiograph reporting was to a very poor standard compared to guidelines. However as CERK is unlikely to be fit for purpose, it would be clear that proper guidance is needed. These results provided justification for the development of guidelines.

When the radiographs reports were re-assessed against the proposed guidelines; “Requirements on reporting & their justification” (Figure above), the results were as below.

Pathology	**Instances missed on OPGs**	**Relative proportion (%) 4/**
Mandibular Trauma	1	1.5%
Dento alveolar trauma	4	5.6%
Infection	42	62.7%
Impaction	17	25.3%
Bony lesions	3	4.4%
TMJ	0	0



The results were as expected for non-dentally trained personnel reporting on OPGs. Mandibular trauma and more obvious bony lesions were very rarely missed when applying our proposed guidelines.

However 'infection' which comprises large carious lesions and periapical pathology was missed on 42 occasions over the 104 orthopantomograms. Certainly, these are more obvious to a dentally trained eye. Such a high value would suggest that even if the radiologists were asked to report on what they thought to be potential sites of infection, it is possible that some lesions may pass unnoticed.

Similarly impacted teeth, which comprises wisdom teeth, unerupted teeth and retained roots was missed on 17 occasions. Again, with guidance in place that indicates that this would be a requirement; this number would likely drop. However again without dental training it may be difficult to adequately describe this.

What the previous two points have highlighted to the authors is that in order for the new guidelines to be effective in a district general hospital environment, they must be complemented by training of radiology staff in identifying dental pathologies. The other alternative would be to absolve them of the responsibility to report on such pathologies. This could be justified for things such as plaque retentive features or overhanging amalgams that are unlikely to be life threatening. However, it would be very difficult medicolegally to be able to absolve a radiology practitioner for the need to report on a large periapical radiolucency that clinically may correspond to the source of a large cervicofacial infection.

Overall formulation of guidelines on the reporting of orthopantomograms in the acute setting was proposed and the results of which are below (page 9). At the time of writing, they are being reviewed by a head and neck radiologist with the aim of implementing suitable aspects at Trust level.

Proposed Guidelines

Indications for OPG reporting in the acute setting

- The x-ray has been ordered by a member of staff who is not dentally qualified.

Justifications for OPGs in the acute setting

- Trauma: mandibular and facial
- Infection: facial & intra-oral swellings, or to exclude dental causes.
- Cystic disease processes
- Temporomandibular joint assessment: fractures, dislocations and disease
- Malignancy: suspected bony involvement lesions or assessment of reconstruction

Standard requirements of the x-ray

- Clear image
- No artefacts i.e. dentures, jewellery
- Mandibular condyle inclusion and positional symmetry
- Flat occlusal plane: parallel to Frankfort's mandibular plane angle
- Avoids superimposition of cervical spine

Requirements on reporting & their justification

- Mandibular fractures and dislocations
    - Symphyseal, parasymphyseal, body, angle, condylar & maxillary.

- Dento-alveolar trauma
    - Crown, root, crown-root, complicated, luxations, avulsions.
- Infection
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Appendix A

Date Taken	Date Reported	Grade of radic	Indication	Missed path vs. CERK	Restorative	Caries/TSL	Periodontal	Periapical	Impacted/retained	Bony pathology	Condylar	Fractures	Other	Missed path vs. OMFS
01/09/2020	02/09/2020	Advanced Pra	Trauma	y	n	n	y	n	n	n	n	n	n	n
02/09/2020	04/09/2020	Consultant	Infection	y	y	y	y	y	y	n	n	n	n	y
03/09/2020	08/09/2020	Advanced Pra	Trauma	y	y	y	y	y	y	n	n	n	n	n
02/09/2020	09/09/2020	Advanced Pra	Trauma	y	y	n	y	y	n	n	n	n	y	y
03/09/2020	05/09/2020	Consultant	Infection	y	y	y	y	y	y	n	n	n	n	y

References

1. Faculty of General Dental Practice (UK). *Selection Criteria for Dental Radiography.* London: FGDP; 2018
2. Faculty of General Dental Practice (UK). *Clinical Examination and Record Keeping.* London: FGDP; 2016