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@bosbraces #BOCBrighton2016
It gives me pleasure to introduce the spring 2016 edition of the CEB – my first as Director of the Clinical Governance Directorate.

Looking through the index I am impressed by the range of topics these audits address, but some themes emerge. Firstly, the importance of communication – with our referrers and colleagues, as well as with our patients. Secondly, several of the audits relate to multi-disciplinary treatment and in particular orthognathic treatment. It is becoming increasingly important for us to justify the efficacy of what we do, whether it is in practice or secondary care. The Audit Committee, under the Chairmanship of Robert Evans, have managed to secure funds of £50,000 from the BOS to support National Audit. Expressions of interest for possible audits will be sought shortly.

The committee will be seeking projects that either are for the full amount (ie 1 large national audit project) or for smaller sums (so the funding is used for a range of projects covering more than 1 topic and/or clinical setting). However, projects looking at the outcome of orthognathic treatment will be encouraged. Further details will be sent to all members in the near future.

I also wish to acknowledge and thank Jadbinder Seehra for all his hard work putting together the new style CEB and also to thank all those who act as referees for the submissions received. Keep up the good work!

Laura Mitchell
Director, Clinical Governance

Reviewers 2015

Thanks to all the reviewers that were active in the Clinical Effectiveness Bulletin in 2015. We are extremely grateful for their help and collaboration.

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Roopa Kukadia           Julie Williams
Rachel Little           Rachael Louise Willis
Welcome to the 2016 spring edition of the BOS Clinical Effectiveness Bulletin. A common request from the membership is access to previous audits published in the Clinical Effectiveness Bulletin. Due to website functionality issues and the way previous editions of CEB have been published this has not been possible. However, the editorial team will be working hard in the future to produce a back catalogue of previous individual articles which can be searched and accessed via the British Orthodontic Society website. Individual audits/articles will be saved as PDF documents and indexed by author, year and title. I hope this will be in place later this year and I will keep you updated regarding the progress of this. I would like to thank Andrew Hayward-Dunn for his assistance with this.

The quality of articles published in the Clinical Effectiveness Bulletin is dependent on the peer-reviews commonly undertaken by specialty trainees. This is not well recognised. In every future spring edition of the bulletin a list of ST4 trainees who have peer reviewed articles during the previous calendar year will be published, acknowledging their hard work and contribution. This is often a thankless task and is greatly appreciated by the CEB editorial team.

Finally, I would like to thank the editorial team, including Ann Wright and Andrew, for all their hardwork and effort in producing this edition of the Clinical Effectiveness Bulletin. If you have any further suggestions for the Bulletin, please do not hesitate to contact me.

Jadbinder Seehra
Editor, BOS Clinical Effectiveness Bulletin

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Northern region patient satisfaction audit: 4th round
S Germain and S Walker
Record keeping in patients with hypodontia: a two cycle audit

Rupal Shah (Dental Core Trainee) and Sarah J. McKaig (Consultant)
Department of Paediatric Dentistry, Birmingham Dental Hospital

Background/rationale
The General Dental Council's 'Standards for the Dental Team' document states that dental professionals must "make and keep contemporaneous, complete and accurate patient records". This is not only a medico-legal necessity within the dental profession, it also helps to improve the continuity of care provided, ultimately leading to improved patient care. This is particularly relevant for large multidisciplinary teams (MDTs) where several clinicians from different specialties are usually involved in patient management. A multidisciplinary Paediatric Dentistry/Orthodontic/Restorative Dentistry clinic, specifically for patients with hypodontia, takes place monthly at Birmingham Dental Hospital. Clinicians from all three specialties attend this clinic, and anecdotal evidence has demonstrated that record keeping for this cohort of patients varies significantly.

Aim and objectives
The aim of this audit was to standardise record keeping for hypodontia patients by assessing what is being recorded at hypodontia clinic appointments and comparing this to the standards set by Paediatric Dentistry/Orthodontic/Restorative Dentistry consultants (MDT).

Standards/guidelines/evidence base
It was recognised that minimum standards vary across specialties with regards to record keeping. A gold standard does not exist; therefore this was created by sending a questionnaire to consultants in the three specialties, asking them to comment on essential information required for record keeping in this cohort of patients. Some of the essential criteria such as 'Date' and 'Time' were taken from the Trust’s record keeping policy. A total of 45 essential criteria were agreed upon. These are 'Referrer', 'Age', 'Date', 'Time', 'Escort', 'Presenting complaint', 'Relevant medical history', 'Has GDP? Regular attender?', 'Compliance/willingness to wear braces', 'Toothbrushing habits', 'Habits', 'History of trauma', 'Missing teeth in primary dentition', 'Family history of missing teeth/dental anomalies', 'Ethnicity', 'Any associated syndromes', 'Extraoral anomalies', 'A-P relationship', 'Vertical', 'Transverse/asymmetry', 'Lip competency', 'Soft tissue pathology', 'Teeth present', 'OHI', 'BPE', 'Caries assessment', 'Upper arch- any crowding/spacing/rotations', 'Lower arch- any crowding/spacing/rotations', 'Dental anomalies', 'Overjet (OJ)', 'Overbite (OB)', 'Incisor relationship', 'Centre lines', 'Canine relationship', 'Molar relationship', 'Crossbites', 'Displacements', 'IOTN', 'OPG radiograph present', 'Radiographic report', 'Diagnosis', 'Provisional treatment plan', 'Appropriate follow up arranged?', 'Name of clinicians patient was assessed by' and 'Letter dictated?'

Sample and data source
This two cycle audit was carried out in the Department of Paediatric Dentistry at Birmingham Dental Hospital. Data was collected for 46 patients attending the hypodontia clinic between May-July 2013 (Cycle 1). A second audit (55 patients) was carried out between February-April 2014 (Cycle 2).

Audit type
Cycle 1 (retrospective) and cycle 2 (prospective).

Methodology
All samples were identified using clinic codes. There were no exclusions. In cycle 1, the clinical records of 46 patients were retrospectively reviewed using a data collection tool against a previously agreed minimum data set. Data collection and analysis was performed on Microsoft Excel® for Mac 2011 Version 14 (Microsoft Corp., Redmond, WA, USA). The findings were presented to the department at an audit meeting and the audit report was disseminated to Orthodontic, Paediatric Dentistry and Restorative Dentistry clinicians, highlighting the recommendations. A hypodontia assessment proforma was created and piloted for 2 months, following which clinicians had an opportunity to provide feedback and changes to the proforma were made accordingly. A prospective audit cycle was then carried out following implementation of the new proforma (cycle 2).

Findings
In cycle 1, there was only 100% compliance to documentation in 5 categories ('date', 'age', 'OPG radiograph present', 'provisional treatment plan' and 'name of clinicians patient was assessed by'). 'Time', 'Has GDP? Regular attender?', 'Compliance/willingness to wear braces', 'Toothbrushing habits', 'Habits', 'History of trauma', 'Missing teeth in primary dentition', 'Ethnicity' and 'extraoral anomalies' were not documented in any of the cases in cycle 1 (Tables 1-3). In cycle 2, the new proforma was used in 85% (n= 47) of cases. Although the standard was not met, documentation has significantly improved from cycle 1 to cycle 2, following implementation of the proforma (Tables 1-3). In particular, there was a considerable improvement in documenting 'trauma history' (80%), 'habits' (84%), 'family history' (80%) and 'ethnicity' (78%) in the 2nd cycle compared to 1st cycle. 'IOTN' remained poorly documented, with a small increase from 4% to 29% (Table 2).

Observations
Tables 1-3 show that documentation for hypodontia patients has generally improved from cycle 1 to cycle 2, following implementation of the new proforma. This is likely to be due to the prompts on the proforma, in keeping with previous studies that have demonstrated how record keeping can be improved by the use of a proforma. 'Appropriate follow up arranged?' was reduced from 89% in cycle 1 to 84% in cycle 2. This was because more patients were discharged in cycle 2; therefore, no follow up was necessary.
In the 2nd cycle, a ‘provisional treatment plan’ was not documented in 1 patient’s record. This may have been because the patient was discharged, however, it should still have been recorded. In the 15% (n=8) of records where the new proforma was not used, 6 clinicians had used routine continuation sheets and 2 clinicians had used an orthodontic new patient assessment proforma. One clinician reported not using the proforma as the patient had been seen on the hypodontia clinic the previous month and the hypodontia proforma had been completed at that visit.

Although documentation for this complex cohort of patients was much improved in the cycle 2, there is still room for improvement, as some clinicians are not recording negatives on the proforma. Record keeping is particularly important for large MDTs like the hypodontia clinic, where several clinicians from different specialties work on the clinic. Implementation of a new assessment proforma has been an effective prompt and ensures there is now consistency in record keeping.

<table>
<thead>
<tr>
<th>Table 1 Documentation of standards for hypodontia patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Date</strong></td>
</tr>
<tr>
<td><strong>Presenting complaint</strong></td>
</tr>
<tr>
<td><strong>Relevant medical history</strong></td>
</tr>
<tr>
<td><strong>Habits</strong></td>
</tr>
<tr>
<td><strong>History of trauma</strong></td>
</tr>
<tr>
<td><strong>Family history of missing teeth/dental anomalies</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cycle 1 (n=46)</th>
<th>Cycle 2 (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A-P relationship</strong></td>
<td>80%</td>
</tr>
<tr>
<td><strong>Lip competency</strong></td>
<td>37%</td>
</tr>
<tr>
<td><strong>Teeth present</strong></td>
<td>93%</td>
</tr>
<tr>
<td><strong>OHI</strong></td>
<td>48%</td>
</tr>
<tr>
<td><strong>Overjet (OJ)</strong></td>
<td>59%</td>
</tr>
<tr>
<td><strong>Overbite (OB)</strong></td>
<td>52%</td>
</tr>
<tr>
<td><strong>Incisor relationship</strong></td>
<td>76%</td>
</tr>
<tr>
<td><strong>Centre lines</strong></td>
<td>50%</td>
</tr>
<tr>
<td><strong>Molar relationship</strong></td>
<td>74%</td>
</tr>
<tr>
<td><strong>IOTN</strong></td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 2 Documentation of examination at hypodontia clinic assessment

Table 3 Documentation of standards for hypodontia patients

**Table 3 Documentation of standards for hypodontia patients**

<table>
<thead>
<tr>
<th></th>
<th>Cycle 1 (n=46)</th>
<th>Cycle 2 (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPG radiograph present</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>96%</td>
<td>100%</td>
</tr>
<tr>
<td>Provisional treatment plan</td>
<td>100%</td>
<td>98%</td>
</tr>
<tr>
<td>Appropriate follow up arranged?</td>
<td>89%</td>
<td>84%</td>
</tr>
<tr>
<td>Name of clinicians patient was assessed by</td>
<td>100%</td>
<td>100%</td>
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**Recommendations**

1) Findings of the audit cycle were presented to the department, highlighting the recommendations (i.e. use of the new proforma, and the importance of recording negative findings on the proforma).
2) Proforma to be included in the induction folder for new staff members.
3) Discussions are on-going within the Paediatric department with regard to rolling out the use of a similar proforma in other MDT clinics.
4) A further audit cycle will be performed in 12 months time.

**Project involvement**

Rupal Shah (Project design, data collection, data analysis, presentation, design and implementation of new proforma and drafting of manuscript)
Sarah J. McKaig (Project lead and approval of manuscript)

**References**

An audit of orthognathic treatment

Claire Furness (Post CCST), Hugh Bellis (Consultant), Pamela Ellis (Consultant), Rebecca Bradley (Consultant), and Velupillai Ilankovan (Consultant)
Dorset County Hospital NHS Foundation Trust

Background/rationale To ensure the orthognathic service at Dorset County Hospital is efficient, of high quality and meets the patients’ expectations, regular clinical audit of the service is undertaken. Regional audits have reported the mean treatment completion time to be 32 months with an average wait for surgery of 3.6 months. Complications should be kept as low as possible. The rate of ID nerve paraesthesia has been reported at 83% immediately post-op and 18% at one year. It has been recommended that 90% orthognathic patients should have a greater than 70% reduction in PAR and this standard has been used by other local units. The PAR efficiency factor is a measure of the operator efficiency calculated by the difference in PAR score divided by the treatment time in months. As a broad measure of satisfaction previous audits have used the standard that 90% patients should be satisfied with the result of the treatment and this was used as a local standard. Results from the two previous audit cycles found a considerable range in treatment times and a long wait for surgery. Since the second audit cycle, PAR scores and post treatment satisfaction questionnaires have been completed for all orthognathic patients to ensure and monitor quality.

Aims and objectives
The aim of this audit was to determine the following: length of orthodontic treatment, waiting time between completion of orthodontics and surgery, identify orthodontic or surgical complications, adherence to the BOS/BAOMS minimum dataset, PAR score, PAR efficiency factor and patient’s satisfaction with treatment.

Standards/guidelines/evidence base
Results from previous audits and national studies were used to set our local standards.

1. 80% patients should complete treatment within 32 months.
2. 90% patients should not wait longer than 4 months when ready for surgery.
3. The rate of ID nerve damage should be less than 83% immediately post osteotomy and 18% at one year.
4. There should be 100% adherence to the BOS/BAOMS minimum dataset.
5. 90% patients should have a greater than 70% change in PAR.
6. The mean PAR efficiency factor should be less than 1.241.
7. 90% patients should be satisfied with their treatment.

Sample and data source
Data was collected for all patients who completed combined orthodontic-orthognathic treatment from 1st January 2011 to 31st December 2013 at Dorchester Hospital. These patients were identified from the departmental database. The results were compared to those in the first and second audit cycles, debonded in 2007/2008 and 2009/2010 respectively. There were 41 patients in the current audit cycle, 20 in audit two and 25 in audit one.

Audit type
Retrospective

Methodology
The models were PAR scored by a calibrated technician and the figures entered onto a spreadsheet. A modified version of the BOS satisfaction questionnaire was used to assess patient satisfaction at debond. The remaining data was collected from reviewing the patient notes. ID nerve damage was recorded as a subjective assessment by the patient recorded in the patient’s notes. Long-term paraesthesia was recorded if there was an area of altered sensation present at the one-year review appointment.

Findings
Of the 41 patients 63% were female and 37% were male. The average age at the start of treatment was 21 years (range 16 to 44). 49% had Class II division 1, 7% Class II division 2 and 44% Class III malocclusions. 54% patients had bimaxillary osteotomies, 36% a mandibular osteotomy and 10% a maxillary osteotomy only. Additional surgical procedures performed included: genioplasty (14), rhinoplasty (4), maxillary augmentation (2) and a midline mandibular split to widen the mandible.

Length of treatment
Table 1 shows the average length of pre-surgical orthodontic treatment, wait for surgery, post-surgical orthodontic treatment and overall duration for the three audit cycles. In this audit, 80% patients completed their treatment within 32 months or less and the audit standard was therefore met. Only 20% patients met the audit standard of waiting less than 4 months for surgery with the mean wait being 6 months.
Table 1 Length of treatment

Complications
There were a number of orthodontic complications. One patient had significant bone loss around the lower incisors due to poor oral hygiene and another had their upper second molars extracted as they could not be aligned due to ankylosis. In patients undergoing bilateral sagittal split osteotomy, 65% patients had temporary (81% audit 2, 53% audit 1) and 25% long-term mental paraesthesia (29% audit 2). Twenty-five patients had a Le Fort I osteotomy and of these 44% had temporary infraorbital paraesthesia (33% in audit 2), 4% unilateral and 40% bilateral. No patients had long-term infra-orbital paraesthesia. Eight patients had other post-operative complications (20%) (24% audit 2, 10% audit 1) including: infection (1 oro-antral fistula and 2 infected plates), unfavourable split (1), severe bleeding peri-operatively related to deficiency in Factor X (1), septal deviation that affected breathing (1), poor occlusion immediately post-operatively (1) and discoloration of the LR3 possibly due to plate position. 5 patients had to return to have a further surgical procedure (12%).

Compliance with the minimum dataset
Pre-operatively 100% patients had available study models, photographs and radiographs; however this reduced at the two-year review appointment, Table 2. Only 46% patients had a post-operative lateral cephalogram and only 73% patients completed a satisfaction questionnaire.

PAR Scores
95% patients met the standard of having a greater than 70% change in PAR. The PAR efficiency factor (1.17) was less than the standard (1.24) (Table 3).

Satisfaction with treatment
73% patients completed a satisfaction questionnaire. 97% patients were satisfied or very satisfied with the treatment overall. The audit standard of 90% was therefore met.

Observations
The overall results of this audit demonstrate that Dorchester Hospital is providing a good orthognathic service and our patients are satisfied with the treatment received. 80% patients met the standard of completing treatment in 32 months or less with a mean of 28 months (range 13-43). However the mean average treatment time was extended due to the long wait for surgery. On average patients waited for 6 months (range 3-12) after their pre-surgical orthodontics had been completed. This has increased since the second audit (5 months) but reduced since the first audit (7 months). Due to this only 20% patients met the audit standard of waiting 4 months or less for surgery. This is an unacceptable delay resulting in an increased number of appointments and therefore cost and inconvenience for patients.

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<tr>
<td>Range</td>
<td>2-28</td>
<td>9-45</td>
<td>8-37</td>
</tr>
<tr>
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<td>6</td>
<td>5</td>
<td>7</td>
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<tr>
<td>Range</td>
<td>3-12</td>
<td>1-11</td>
<td>1-11</td>
</tr>
<tr>
<td>Mean post-surgical orthodontics</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Range</td>
<td>1-10</td>
<td>2-10</td>
<td>2-11</td>
</tr>
<tr>
<td>Mean total treatment time</td>
<td>28</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>Range</td>
<td>13-43</td>
<td>16-55</td>
<td>17-50</td>
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</table>

Table 2 Compliance with the minimum dataset
the patients. The primary cause of delay was lack of capacity for surgery, however patient unavailability also contributed to this. 65% patients who had a mandibular osteotomy had temporary paraesthesia. 25% patients had mental paraesthesia present one-year post surgery compared to 29% in the second audit cycle. Clearly the standard was not achieved. However, these figures may represent an over-estimation due to the subjective assessment that is currently employed. A more standardised approach is required. There was excellent adherence with the pre-treatment minimum dataset (100% for photographs, study models and radiographs). However, only 46% patients had a lateral cephalogram radiograph taken within 3 weeks of surgery. This was due to confusion within the team as both the Maxillofacial and Orthodontic department assumed the other was taking this radiograph. This has now been resolved and the Orthodontic team are responsible for requesting this.

Within this audit sample only 73% patients completed a satisfaction questionnaire. This questionnaire was introduced at the beginning of the current cycle however this was not always completed due to a variation in when these were distributed by the clinician.

Compliance with the minimum dataset at the two-year review appointment was low and ranged from 63–74%. This was due to 26% patients not attending their appointments. However of those attending almost 100% was achieved. It is difficult to see how this can be improved as if patients fail to attend two review appointments they are discharged from the department to prevent wastage of NHS resources.

The audit standard for percentage PAR reduction was met. The results were similar to previous published audits. The mean PAR efficiency factor was less than the standard suggesting that Dorset County Hospital is running an efficient and high quality service. 97% patients were satisfied or very satisfied with their overall treatment and 93% would recommend this treatment to others. This is comparable to recent audits.

**Recommendations**

1. The waiting time for surgery needs to be reduced. A new Consultant Maxillofacial surgeon is due to be employed, this should increase capacity and reduce the long wait for surgery.
2. The Maxillofacial department need to investigate the apparent high rate of mental paraesthesia and record this in a more standardised and consistent manner.
3. To ensure compliance with the minimum dataset all patients should have a lateral cephalometric radiograph taken within three weeks of surgery and complete a satisfaction questionnaire at debond.
4. Re-audit in 3 years.

**Project involvement**

Claire Furness (Project lead, project design, data collection, manuscript drafting)
Hugh Bellis (Project design and approval of manuscript)
Pamela Ellis (Project design and approval of manuscript)
Rebecca Bradley (Approval of manuscript)
Velupillai Ilankovan (Approval of manuscript)

**References**

Orthodontists and the GDP: How well do we communicate?
A multi-centre audit

Leonie Seager (ST)1, S O’Connell (ST)2, A Patel (ST)3 and S Kotecha (Consultant)1
Birmingham Dental Hospital & University Hospital of North Staffordshire1, Birmingham Dental Hospital & Solihull Hospital2, Birmingham Dental Hospital & Walsall Hospital3 and Birmingham Dental Hospital & University Hospital of North Staffordshire1

Background/rationale
Communication between the Orthodontist and the GDP is essential and helps to ensure efficiency as well as ensuring the maintenance of regular and appropriate check-ups and prevention by the GDP during orthodontic treatment as recommended in the Department of Health evidence based toolkit for prevention1. Following orthodontic treatment, it is vital that the GDP is also informed of the prescribed retention protocol including the type of retainer, so that they can not only repair and replace the appliance as required, but also help motivate and monitor retainer wear once the patient has been discharged from formal orthodontic care. In a recent audit carried out in Wakefield2 only 18 out of 62 GDPs surveyed thought that the discharge letter contained sufficient information, whilst a multi-centre UK wide audit highlighted that only 70% of GDPs said that they received a discharge letter of which less than half detailed the retention regime or described the appliance3. Another recent audit that looked at patients’ understanding of retention found that only 54% of patients could state a reason for why they should wear retainers and even then, the responses given were often incorrect4. This highlights further the important role of the GDP in helping to manage long-term retention.

Aim and objectives
The primary aim of this audit was to investigate the level of written communication between the orthodontist and GDP from initial patient contact to discharge and to assess if recognized “valued information” was detailed to the GDP following initial patient contact. A secondary aim was to evaluate the information provided to the GDP with specific regard to retention following active treatment.

Standards/guidelines/evidence base
It was determined that 100% of patients should have correspondence detailing the key patient attendances and outcomes. 100% of patients should also have the retention regime and retainer type detailed in at least one post-active treatment or discharge letter. As there are limited published guidelines in these areas5,6, the opinion of a number of orthodontic consultants in the West Midlands was also obtained and a consensus agreed on the key time points for when there should ideally be written communication from the Orthodontist to the GDP. The agreed key time points and key valued information to be included in the new patient contact letter are outlined in Table 1 and Table 2.

Sample and data source
In total, 250 sets of medical records were retrospectively audited, 50 from each participating orthodontic department. These were: Birmingham Dental Hospital, Royal Stoke University Hospital, County Hospital, Stafford, Royal Shrewsbury Hospital and Solihull Hospital. Only patients who had been discharged from the orthodontic department at the time of the audit data collection in March 2015 were used in the audit.

Audit type
Retrospective

Methodology
The study design had been previously approved by the Research and Development departments at participating units. Suitable records were identified by selecting 50 consecutive patients who had been de-bonded between January and December 2013, allowing time for the patient to pass from the supervised retention phase to being discharged.

Findings
The gold standards of 100% of GDPs receiving correspondence at the recommended time-points (Table 1 and Table 2) and 100% of GDPs receiving information regarding the patient’s retention strategy were not met (Figure 1).

The most common letter sent to GDPs was following the new patient consultant appointment. In general this letter contained most of the information that is valued by GDPs. However, in over half (60% regional average) of these letters, no indication was given to the GDP regarding when the patient would be commencing orthodontic treatment. This is important information should the department wish to avoid calls from GDPs or patients requesting information on waiting times.

The most frequently missed correspondence to the GDP was at the start and completion of active treatment with only around half of GDPs (55% regional average) receiving any details regarding the patient retention regime. The highest scoring unit in respect to delivering information on retention was the unit where it was noted that a discharge letter template is currently in use.
to ensure that the GDP is made aware of any treatment the patient is receiving. The low scores obtained in some departments may be due to orthodontic trainees and clinical assistants being unaware of departmental protocols regarding correspondence and what information should be included in correspondence. Indeed, the lowest scoring department overall was Birmingham Dental Hospital which has considerably more ST and post-CCST trainees working there than at other units.

**Recommendations**

1) Some departments have already started using letter templates. These templates will be checked to ensure all recommended features are present before sharing with the departments not currently using templates.  
2) Write a detailed “correspondence with the GDP” protocol for each participating department.  
3) Present the findings of the audit at departmental meetings and West Midlands Consultant Orthodontists Clinical Governance Group meeting.  
4) Specialist trainee handbook to include letter templates, which can be used by trainees to aid efficient and appropriately detailed dictations.  
5) Re-audit in 3 years time, to allow changes to be implemented and allow a new cohort to pass through treatment and into retention.  
6) Re-audit of letters following new-patient clinic and retention information provided to GDPs in 12 months.

**Acknowledgements**

The authors wish to acknowledge all the departments who agreed to take part in this audit and all the staff at each participating unit who kindly sourced all the clinical records used in this audit.

**Project involvement**

Leonie Seager (Project design, data collection, manuscript drafting)  
S O’Connell (Data collection)  
A Patel (Data collection)  
S Kotecha (Project lead and approval of manuscript)

**References**

**Multi-disciplinary clinics: are the referrals appropriate?**

**Geetanjali Sharma** (ST4) and **Nigel Taylor** (Consultant)
Royal Surrey County Hospital NHS Foundation Trust

**Background/rationale**
The UK Department of Health defines a multidisciplinary team as a group of people of different health-care disciplines, which meets together at a given time (whether physically in one place, or by video or teleconferencing) to discuss a given patient and who are each able to contribute independently to the diagnostic and treatment decisions about the patient. The multi-disciplinary clinics (MDT) at the Royal Surrey County Hospital provide a consultant led service for the management of patients requiring jaw surgery and with severe dento-alveolar deformities. Cleft lip and/or palate patients should be seen on dedicated cleft clinics held as part of the regional South Thames Cleft service.

MDT clinics have been proposed as the best approach to delivering quality healthcare since multiple disciplines coming together as a team have a positive influence on the quality of care. Specifically, MDT clinics help to reduce errors and duplication, improve cost-effectiveness and efficiency and allow patients to be engaged in their treatment. At the Royal Surrey, over 50 MDT clinics take place each year and run at maximum capacity. These clinics are frequently over-booked following an increased need for combined treatment assessments. MDT clinics are expensive and this is reflected in the enhanced outpatient tariff. It is important to ensure that every attendance at a joint clinic is appropriate to deliver maximum patient benefit. A review of referrals to the multidisciplinary clinics was carried out to identify inappropriate referrals and allow best use to be made of this valuable but expensive resource.

**Aims and objectives**
The aim of this audit was to assess the appropriateness of patients referred to the MDT clinics at the Royal Surrey County Hospital over a two-year period.

**Standards/guidelines/evidence base**
There are no previous published audits in this area from which a standard could be used. Hence a gold standard was formulated. All patients (100%) referred to the MDT clinic should require multi-disciplinary input. This includes patients with dento-facial deformity or sleep apnoea requiring orthognathic surgery, complex dento-alveolar deformities such as ectopic teeth requiring expose and bond or surgical extraction and severely impacted teeth requiring surgical extraction. Patients with clefts of the lip and/or palate should only be seen on dedicated cleft clinics.

**Sample and data source**
This audit was carried out within the orthodontic department at Royal Surrey County Hospital NHS Foundation Trust between 1st January 2012 and 31st December 2013. In total seven hundred and sixty-six patients were included in this audit.

**Audit Type**
Retrospective

**Methodology**
Data from patients who were booked on the multi-disciplinary clinic was retrieved from clinic preparation sheets and/or patient records. A data collection sheet was designed and used to record the reason for the patient’s referral to the clinic in both 2012 and 2013. All data was entered into a Microsoft Excel (2010) spreadsheet from which the results were calculated.

**Findings**
The results highlight that the standard was not met in 2012 or 2013. Table 1 demonstrates the reasons for referral to the MDT clinics and those highlighted in blue are indicative of inappropriate referrals. 84% and 76% of cases in 2012 and 2013 respectively, were considered appropriate referrals to the MDT clinic. Orthognathic surgery accounted for 48% cases in 2012 and 41% cases in 2013. Patients with dento-alveolar deformities formed the second largest group of patients seen, accounting for 27% in 2012 and 31% patients in 2013. There is a subgroup of patients (accounting for 6% of patients seen in 2012 and 3% in 2013) that were on the MDT clinic to discuss their dental plan. For example, the option of whether to expose and bond tooth/teeth versus extraction in borderline cases would be discussed with the oral surgery team to determine a definitive treatment plan. These were included as appropriate referrals.

<table>
<thead>
<tr>
<th>Case Mix</th>
<th>2012 (%)</th>
<th>2012 (No.)</th>
<th>2013 (%)</th>
<th>2013 (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss option of orthognathic surgery</td>
<td>16.5</td>
<td>67.5</td>
<td>18</td>
<td>64</td>
</tr>
<tr>
<td>Pre-Surgical Joint Planning</td>
<td>9.5</td>
<td>35.5</td>
<td>7.5</td>
<td>25</td>
</tr>
<tr>
<td>Post-op orthognathic review</td>
<td>23.5</td>
<td>92.5</td>
<td>16.5</td>
<td>57</td>
</tr>
<tr>
<td>Cleft patient</td>
<td>11.5</td>
<td>45.5</td>
<td>7.5</td>
<td>26</td>
</tr>
<tr>
<td>Sleep Apnoea</td>
<td>3.5</td>
<td>11.5</td>
<td>1.5</td>
<td>5</td>
</tr>
<tr>
<td>Joint planning of oral surgery</td>
<td>27.5</td>
<td>109.5</td>
<td>31</td>
<td>110</td>
</tr>
<tr>
<td>Review unerupted teeth</td>
<td>0</td>
<td>0</td>
<td>2.8</td>
<td>10</td>
</tr>
<tr>
<td>Orthodontic review</td>
<td>4.5</td>
<td>16.5</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Review to assess if funding has been approved</td>
<td>0.5</td>
<td>2.5</td>
<td>0.5</td>
<td>3</td>
</tr>
<tr>
<td>Frenectomy</td>
<td>0.5</td>
<td>2.5</td>
<td>0.8</td>
<td>3</td>
</tr>
<tr>
<td>Orthodontic treatment</td>
<td>0.7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Discuss dental plan</td>
<td>6.5</td>
<td>26.5</td>
<td>3.5</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>100.5</td>
<td>408.5</td>
<td>100.0</td>
<td>358.0</td>
</tr>
</tbody>
</table>

Table 1 Reason for referral to the Multi-disciplinary clinic
Indication(s) for referral to the Multi-disciplinary clinic

<table>
<thead>
<tr>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss orthognathic surgery</td>
</tr>
<tr>
<td>Pre-Surgical Joint Planning</td>
</tr>
<tr>
<td>Post-op orthognathic review</td>
</tr>
<tr>
<td>Sleep Apnoea</td>
</tr>
<tr>
<td>Joint planning of oral surgery case e.g. expose and bond of ectopic teeth, potentially difficult extractions, failure of eruption</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

To be completed by senior clinician

<table>
<thead>
<tr>
<th>Appropriate referral?</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES/NO</td>
</tr>
<tr>
<td>Signature:</td>
</tr>
</tbody>
</table>

Figure 1 Referral proforma for multi-disciplinary clinics

Observations

Inappropriate referrals can have a significant impact on the efficiency of the clinic with waiting times for prospective patients who require joint input from the Oral and Maxillofacial Surgeon and Orthodontist increased. The number of inappropriate referrals to this MDT clinic amounted to 68 in 2012 and 87 in 2013. This means that a total of 155 appointments could have been made available to patients requiring joint input if inappropriate referrals were not made. Currently, the average waiting time for a patient to be seen on this MDT clinic is 2 months (maximum 3 months). Ideally however, it should be possible to book a patient onto the next forthcoming clinic since delays lengthen the treatment period for the patient. Fewer and more appropriate referrals booked to this clinic will permit more time to manage more complex cases. At the Royal Surrey, separate cleft clinics have been established for more than 20 years to manage patients with Cleft lip and/or palate. This clinic is represented by a Specialist cleft surgeon, Consultant Orthodontist, trainees, speech therapists and psychologists all of whom are involved in the management of cleft cases. It is therefore preferable that all cleft patients are seen on dedicated cleft clinics at all stages of their treatment in line with the strict protocol set out in the Department of Health circular following CSAG 1998.

2.8% patients were booked on the multi-disciplinary clinics in 2013 to review the status of un-erupted teeth or for a straightforward orthodontic review (0.3%). These patients do not require joint orthodontic-surgical input unless a definitive decision has been made by the clinician treating the patient to expose and bond an un-erupted/ectopic tooth or advice is required from the surgeon. Patients requiring routine orthodontic extractions should be booked directly into the oral surgery clinics with a clear documented plan as these patients do not require joint treatment planning/management.

At the Royal Surrey funding for orthognathic treatment for patients with a Surrey postcode and aged above 21 years of age is not automatically commissioned. 13% of patients were reviewed on the multi-disciplinary clinic to assess whether funding for orthognathic surgery had been approved in 2013 compared to 0.5% of patients in 2012. Interestingly, this may be a reflection of the transitional changes in funding for this group of patients that took place during the period of the audit. This finding also demonstrates the wasted resource when clear commissioning plans do not exist.

A review of access to the MDT clinic was useful and highlighted the additional appointments that could have been made available. The audit standard for the MDT clinic was not met. The effectiveness and efficiency of the MDT clinics can be improved by filtering out inappropriate referrals and thereby reducing the waiting time for the management of patients requiring joint input from Surgeons and Orthodontists.

Recommendations

1) All patients seen on the MDT should require a joint opinion from both the surgeon and orthodontist and this should be confirmed using a referral proforma sheet (Figure 1).
2) All referrals must be screened by a senior clinician (Consultant/Post- CCST) prior to booking an appointment on a joint clinic.
3) Results of the audit and the new referral proforma to be communicated to all team members.
4) This audit is to be repeated in 12 months to assess compliance with the new referral criteria to the multi-disciplinary clinics.

Acknowledgements

We would like to thank Ms Gursharan Minhas (Consultant Orthodontist at the Royal Surrey County Hospital) for her support.

Project Involvement

Geetanjali Sharma (Project lead, project design, data collection, manuscript drafting)
Nigel Taylor (Project design and approval of manuscript)

References

2. Department of Health circular 1998 (HSC 238)
An audit on the use of mouthguards in orthodontic patients before treatment

Kate Parker (ST), Benjamin Marlow (ST), Neil Patel (Specialist) and Daljit Gill (Consultant)
Eastman Dental Hospital, University College London Hospitals (UCLH) NHS Trust

Background/rationale
Participation in sport carries the risk of sustaining dental trauma and has been found to account for 10-39% of all dental injuries. Contact sports can be defined as sports where significant contact can occur between opponents. These sports are prone to injuries, with dental trauma being the most common orofacial injury sustained. The use of mouthguards have been reported to reduce dental injuries by 1.6-1.9 times. The American Dental Association has produced guidelines on which sports mouthguards should be worn. However, in the UK, guidance on mouthguard wear is more limited with it only being mandatory to wear mouthguards at school whilst playing rugby, lacrosse, field hockey and participating in martial arts and boxing. Professional rugby regulations mandate compulsory kit for players but they do not stipulate the use of mouthguards. Although specific rules exist within schools, there are no current UK guidelines advocated by dental bodies, specifying which are considered contact sports or for which sports mouthguards should be worn. Within our department it was noted that patients did not routinely report wearing mouthguards, therefore, this audit was undertaken to investigate mouthguard wear and any barriers to their use.

Aims and objectives
The primary aim of this audit was to establish if mouthguards are commonly used by children during contact sports. Additional aims included: to assess which sports children wear mouthguards for, types of mouthguards which are worn, the prevalence and cause of any previous dental trauma and to investigate any perceived barriers to mouthguard wear.

Standards/guidelines/evidence base
The British Dental Health Foundation considers rugby, football, boxing, cricket, hockey and American football to be contact sports. The British Orthodontic Society consider contact sports to be any sport where significant contact can occur between opponents. Therefore, for this audit, any sport where contact between opponents could occur was considered a contact sport. A gold standard of 100% of children should wear a mouthguard whilst playing contact sports was set.

Sample and data source
All patients under the age of 19, attending the Eastman Dental Hospital between 1st January 2015 to the 1st April 2015 for new patient record appointments with first year orthodontic registrars were invited to be included in the audit.

Audit type
Prospective

Methodology
Data was collected for 100 consecutive patients attending new patient records appointments. No patients declined to participate in the audit. Data collection was via a double-sided A4 questionnaire (Appendix 1), which comprised of 10 questions relating to mouthguard wear and sports participation. The questionnaire was developed within the orthodontic department and was piloted and checked for clarity and readability before commencing data collection.

Findings
Data was collected for 100 patients (47 were male and 53 female). The average age was 13.2 years with a range from 9 – 18 years. Twenty-nine patients had previously sustained dental trauma and 4 of these had experienced multiple episodes of trauma. Of the patients who had sustained trauma, 14 had sustained this during sport, 10 due to a trip or fall, 9 whilst playing with friends and 2 patients reported trauma due to other causes. Eighty-four patients played sport whilst 16 did not take part in any sporting activities. Of these 84 patients, four patients participated only in sports which were considered non-contact, such as running and dance, whilst all other patients took part in at least one contact sport. The most common sports undertaken were football, basketball, swimming, netball and rugby (Figure 1).

Figure 1 Sporting activities undertaken

Fourteen patients had previously sustained dental trauma during sport (16.7%). Figure 2 shows the sports in which dental trauma had been sustained which were most commonly football (4 patients), followed by field hockey (2 patients), basketball (2 patients) and gymnastics (2 patients).
Of the patients who played contact sport, only 4 patients always wore a mouthguard (5%), 15 sometimes (18.8%) and 61 (76.2%) never wore a mouthguard. Mouthguards were only worn for rugby, field hockey, martial arts, and boxing. Of the 19 patients who wore mouthguards, 18 used shop-bought and 1 patient used a custom made mouthguard. The most common reason for not using a mouthguard was being unaware that one was required (95.4%). Other reasons included losing the mouthguard, the mouthguard being uncomfortable and the patient feeling that they could not play sport as well wearing a mouthguard (1.5% each).

In the UK it is mandatory to wear mouthguards at school whilst playing rugby, lacrosse and field hockey and whilst participating in martial arts and boxing. Thirty-six patients played these sports and therefore should wear a mouthguard. Of these patients, 4 always wore a mouthguard and of these none had previously sustained trauma. Fourteen patients sometimes wore a mouthguard, of which 5 had previously sustained trauma (35.7%) and 18 patients never wore a mouthguard, of which 4 had sustained previous trauma (22.2%). Compared to American guidance, where mouthguards are recommended for a wider range of sports, 80 patients should have worn a mouthguard. Of these, 4 patients always wore a mouthguard, of which 5 had previously sustained trauma (33.3%) and 61 never wore a mouthguard, of which 7 had sustained previous trauma (11.5%). This audit shows a low incidence of mouthguard wear with the gold standard of 100% not being met.

Observations
A prospective audit was undertaken as information on sports playing and mouthguard wear was not routinely recorded in patients’ medical records, therefore a retrospective audit collecting data from medical records would not have allowed full and accurate data collection. This audit found only 5% of patients always wore a mouthguard and 18.8% sometimes wore a mouthguard. The main reason for mouthguards not being worn was patients not being aware they were required (95.4%). This is despite there being widely available literature advising the use of mouthguards for contact sports. Of the patients who wore mouthguards the majority wore shop bought (94.7%). It has been reported that custom made mouthguards offer superior protection than shop bought, therefore, although these patients wear mouthguards they may require additional advice and information regarding the best type of mouthguard to wear for maximum protection. The increased incidence of dental trauma during sporting activities when not wearing a mouthguard is widely cited in the literature and our audit supports the finding that more patients sustained trauma when they never or only sometimes wore a mouthguard. In the UK it may be advisable to adopt an approach similar to that used in America where mouthguards are routinely worn for a wider range of sports. Further research regarding when mouthguards should be worn for different sports is warranted.

Recommendations
1) Results of this audit presented at a departmental audit meeting.
2) Clinicians should routinely ask patients about any sports they participate in.
3) Mouthguards should be recommended for all patients who play contact sports.
4) A patient information leaflet on mouthguards to be developed.
5) This audit to be repeated in 12 months.

Project involvement
Kate Parker (Project design, data collection, manuscript drafting, presentation of protocol and results)
Benjamin Marlow (Project design, data collection, manuscript drafting, presentation of protocol)
Neil Patel (Project design and approval of manuscript)
Daljit Gill (Project lead and approval of manuscript)

References
Mouthguard Questionnaire

We would be very grateful if you would complete this questionnaire on sports and mouthguard use.

1. **Gender:** Male [ ] Female [ ]

2. **Age:** __________________________

3. **Have you previously had any damage, knocks or bangs to your teeth?**
   - Yes [ ] No [ ]

4. **If yes, how did this happen?**
   - (a) **Sports** [ ]
     If sports, please indicate which below:
     - Football [ ]
     - Basketball [ ]
     - Gymnastics [ ]
     - Skiing [ ]
     - Rugby [ ]
     - Netball [ ]
     - Lacrosse [ ]
     - Martial arts [ ]
     - Cricket [ ]
     - Horse riding [ ]
     - Ice hockey [ ]
     - Skateboarding [ ]
     - Field Hockey [ ]
     - Swimming [ ]
     - Boxing [ ]
     - Squash [ ]
     - Other [ ] Please specify what sport this involved: ___________________________________
   - (b) **Trip or a fall** [ ]
     If so, please specify where this happened: __________________________
   - (c) **Playing with friends (but not sports related)** [ ]
   - (d) **Other, please specify** __________________________

5. **Do you play sport(s)?**
   - Yes [ ] No [ ]

6. **If yes, which sports do you play?** (Tick all that apply)
   - Football [ ]
   - Basketball [ ]
   - Gymnastics [ ]
   - Skiing [ ]
   - Rugby [ ]
   - Netball [ ]
   - Lacrosse [ ]
   - Martial arts [ ]
   - Cricket [ ]
   - Horse riding [ ]
   - Ice hockey [ ]
   - Skateboarding [ ]
   - Field Hockey [ ]
   - Swimming [ ]
   - Boxing [ ]
   - Squash [ ]
   - Other, please specify ____________________________________________

7. **Do you wear a mouthguard whilst playing sport?**
   - Yes, all of the time [ ]
   - Yes, sometimes [ ]
   - No, never [ ]

8. **If yes, which sports do you wear a mouthguard for?** __________________________

9. **Which type of mouthguard do you wear?**
   - Shop bought [ ]
   - Made by my dentist [ ]
   - Bought on the internet [ ]
   - Other, please specify ____________________________________________

10. **If no, what are the reasons for not wearing a mouthguard?** (Tick all that apply)
    - Cost [ ]
    - I could not find one to buy [ ]
    - I have never been told that I needed a mouthguard [ ]
    - Lost mouthguard [ ]
    - I have/had one but it is uncomfortable [ ]
    - I feel that I can't play the sport as well with mouthguard [ ]
    - Other, please specify ____________________________________________

Thank you very much for taking the time to complete our questionnaire
Regional audit on referrals and reporting of Cone Beam Computed Tomography (CBCT) to assess root resorption associated with impacted canines

Zynab Jawad (ST), John Ahn (SHO), Fiona Carmichael (Consultant), Nadine Houghton (Consultant) and Claire Bates (Consultant) Leeds Dental Institute

Background/rationale

The most common use of CBCT imaging in orthodontics is to determine the location of impacted teeth, especially impacted maxillary canines and to diagnose root resorption of the adjacent teeth. Conventional 2D radiographic imaging has been commonly used for its assessment, however this is often limited for definitive diagnosis due to magnification, distortion, superimposition and misrepresentation of structures. The introduction of three-dimensional CBCT provides more accurate imaging and has facilitated the acquisition of information that can lead to improved detection rates of root resorption. This advancement of CBCT technology allows orthodontists to produce more precise and accurate treatment plans, resulting in more predictable and successful treatment outcomes. Although the radiation dose of CBCT is relatively lower than for conventional CT, inappropriate use of CBCT may increase the collective radiation dose and subsequently a lifetime risk of developing cancer. Practitioners must strictly adhere to the latest guidelines to obtain the most pertinent information while exposing patients to the least amount of radiation. The Faculty of General Dental Practitioners and the British Orthodontic Society recommend using CBCT to assess root resorption associated with impacted canines only if sufficient diagnostic information cannot be obtained using conventional radiography. Similar recommendations are suggested by the SEDENTEXCT Radiation Protection guidelines for CBCT. Practitioners must justify an exposure and provide adequate information to a radiologist and a radiologist must provide a report of the CBCT imaging.

Aims and Objectives

The aims of this audit were to assess if the Leeds Dental Institute (LDI) is compliant with the SEDENTEXCT guidelines regarding the justification and radiographic evaluation of CBCT. Additional aims included: to determine the number of CBCT images taken to assess root resorption associated with impacted canines, source of referrals for CBCT and if a radiographic report was provided by the radiologist reporting on the CBCT.

Standards/guidelines/evidence base

The gold standard for this audit was derived from the SEDENTEXCT guidelines 2012. A 100% compliance with the guidelines for the following was decided: all CBCT exposures need to be justified with appropriate and informative referrals and documentation/provision of previous radiographic images. All CBCTs should be reported on and provide sufficient information to aid diagnosis and treatment planning.

Sample and data source

This audit was carried out at the Leeds Dental Institute between 1st July 2013-1st July 2014. All consecutively requested CBCTs for the assessment of impacted canine associated root resorption were included.

Audit type

Retrospective

Methodology

CBCT referrals to the radiology department at the Leeds Dental Institute (LDI) were reviewed to determine the origin of referrals (external and internal) within the West Yorkshire Region. All consecutively taken CBCTs between 1st July 2013-1st July 2014 for the assessment of impacted canine associated root resorption were included. All cases were identified from an electronic software, which stores all imaging taken at the LDI. All referrals, CBCT reports and patient clinical records were identified and the following information recorded: clinical information, prior conventional radiography and clinical evaluation. Data was recorded and analysed using Microsoft Excel package.

Findings

A total of 55 CBCT images taken to assess root resorption associated with an impacted canine were included in this audit. The orthodontic department accounted for 74.5% referrals (Figure 1) and 56% of these were received internally from the orthodontic department at LDI (Figure 2). 100% cases had a completed request form. In compliance with the SEDENTEXCT guidelines 2012, a full clinical examination was performed following a radiographic assessment with at least one conventional radiograph for all (100%) cases. 100% cases had a conventional radiographic image taken prior to CBCT request. Only 54.5% request forms recorded which tooth/teeth were suspected of resorption. A higher percentage (58.5%) of orthodontic referring practitioners provided this information compared to other specialties (Figure 3). A radiographic report was completed in 100% cases hence meeting the audit standard. The presence/absence of root resorption was also recorded in 100% cases. The precise position of the canine was reported in 88.1% cases. Root resorption of adjacent tooth/teeth was noted in 46.3% cases. The position and amount of resorption was provided in word description format within the CBCT report.

Figure 1 CBCT referrals from each specialty within Leeds Dental Institute
Observations

Only 58.5% orthodontic practitioners reported which tooth/teeth were suspected to have root resorption in the request forms. Although this percentage is higher than that of other specialties, all referring practitioners must provide sufficient clinical information in order to assist a CBCT practitioner to perform the justification process. In addition, this information helps a radiologist to acquire a better knowledge of individual cases and to perform a more pertinent clinical evaluation. The presence/absence of root resorption was also reported in 100% cases, however the description of the area and degree of the resorption varied between the reports. The location and degree of root resorption were provided in a written description format. These descriptions varied in terms of detail from case to case (e.g. quite extensive resorption, resorption on the buccal aspect of the tooth). The position of the canine was reported in 88.1% of cases. An accurate and detailed report of the area and degree of root resorption, as well as the position of the canine, are essential and can aid diagnosis and treatment planning. Limited literature on the referring and reporting of CBCT is available. The findings of our audit are similar to those previously reported. In this audit 100% CBCT investigations were taken in accordance with the SEDENTEXCT guidelines with an appropriate referral and radiology report for each CBCT image present. 100% cases in this audit had a previously taken conventional radiograph supporting the justification process. Our results also compare favourably to another audit carried out in the Midlands on service planning of CBCT for the future.

An objective method of reporting on CBCT images taken for the assessment of root resorption associated with impacted canines is desirable.

Recommendations

1) To adapt an internal referral proforma for requesting CBCT to include a prompt box for the clinician to indicate which teeth are suspected of root resorption.
2) Re-audit in 6 months following the implementation of this proforma.

Project involvement

Zynab Jawad (Project lead, design, data collection, manuscript drafting)
John Ahn (Data collection, manuscript drafting)
Fiona Carmichael (Design and approval of manuscript)
Nadine Houghton (Design and approval of manuscript)
Claire Bates (Design and approval of manuscript)

References

Cephalometry: repeatability, method error and efficiency of computer assisted versus hand tracing

Miriam Bouchiba (Dentist)¹, Nora Donaldson (Statistician)², Stephanie Oiknine (Specialist)¹ and Dirk Bister (Consultant)¹
Department of Orthodontics, Guy’s Hospital, London¹ and Stony Brook University, Department of Applied Mathematics and Statistics, Stony Brook, New York, United States²

### Background/rationale
Cephalometry has been shown to be susceptible to numerous inaccuracies; it is essential these are kept to a minimum for maximum clinical yield¹. Errors arise from identification of anatomical landmarks, patient positioning leading to projection errors and the quality of the image itself²,³. All those lead to inaccuracies of repeatability, reproducibility and subsequent validity of the analysis. The proposed advantages of using computerized tracings include improved efficiency of the tracing. Contemporary radiographs are digital and images can be modified for landmark identification allowing the use of different cephalometric analyses without the need for re-tracing. Previous studies have compared the accuracy and reproducibility of computerized and conventional tracings. Hand and computer tracings are reported to be comparable⁴. Despite hand-tracing being viewed as the gold standard for Cephalometry, semi-automatic computerised tracing was found to be advantageous obviating the need to physically draw landmarks/planes and angles are automatically calculated⁵. However, digital cephalometric software needs to be reassessed for errors, which may be clinically significant⁶.

### Aims and Objectives
The aims of this audit were primarily to assess the repeatability of computer assisted cephalometric tracing (Dolphin®, version 10.5.265) and hand-tracing. Additional aims included assessment of the method error of hand and computerized tracings, the efficacy of the two methods (time taken to trace the radiographs) and to compare the values of the 40 radiographs chosen for the audit with the norms provided by the Eastman Analysis.

### Standards/guidelines/evidence base
Based on previous research, differences for measurements between computer assisted and hand-tracing should not exceed 2 degrees⁵.

### Audit type
Criterion based

### Sample and data source
40 lateral cephalograms of Caucasian patients with a class I incisor relationship, which had previously been taken for diagnostic purposes at the orthodontic department, Guy’s Hospital, were selected.

### Methodology
Relevant linear and angular measurements of all 40 radiographs for the ‘Eastman analysis’ were recorded for hand tracing. The radiographs were all traced four times by the same assessor (MB), twice by hand and twice using computer software (Dolphin® version 10.5.265) with an image quality of 300 DPI. All radiographs were traced in August 2012 and were re-traced 4 weeks later. All radiographs were taken with the same cephalostat and printed from the same printer at 100% magnification. The scanned radiographs (Epsom 750 Pro ‘backlit’ scanner) were used for computerized cephalometric assessment. Analysis of variance with random effect was undertaken to assess the repeatability of the measurements within the same observer for both hand and computerized tracing, and to assess the repeatability of both methods. The intra-class correlation (ICC) was used to quantify the degree of consistency between the methods (method error) (p<0.05). Levels of agreement for correlation coefficient were: 0.00-0.10 = Poor; 0.10-0.30 = Low; 0.30-0.50 = Moderate; 0.50-0.70 = Good; 0.70-0.90 = Strong Agreement/Very Good; 0.90-1.00 = Almost Perfect/Excellent.

### Findings
The repeatability of manual and computerized tracings is shown in Table 1 and Table 2. The between-case spread was found to be highly significant, indicating consistency in the measures taken by hand and by Dolphin. Most measurements showed high agreement for repeatability and method error of manual and computerized tracing. There were no statistically significant differences between the methods (P<0.05) for any measurement, demonstrating a high level of reproducibility. Our results achieved the audit standard, as the differences between the methods did not exceed 2 degrees. The Class I sample of 40 Caucasians used for this audit differed significantly from the ‘Eastman standard’ as shown in Table 3. Statistically significant differences between the contemporary cephalograms and the ‘Eastman’ norms were found for SNA, SNB, UMX, LAFH. A paired t-test was used to compare the time taken for computer tracing and hand tracing. The latter was statistically significantly slower by 57.8 seconds (95% 46.7 to 68.9: P<0.001).
### Table 1 Analysis of variance with random effects for hand tracings and between-case range

<table>
<thead>
<tr>
<th>Cephalometric variable</th>
<th>ICC (95% CI)</th>
<th>Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (Sella-Nasion to A point)</td>
<td>23.7 (P&lt;0.001)</td>
<td>92% (87, 97)</td>
</tr>
<tr>
<td>SNB (Sella-Nasion to B point)</td>
<td>15.5 (P&lt;0.01)</td>
<td>91% (81, 95)</td>
</tr>
<tr>
<td>ANB</td>
<td>2.1 (P&lt;0.005)</td>
<td>36% (9, 63)</td>
</tr>
<tr>
<td>UMX (Upper incisor to Maxillary plane)</td>
<td>6.3 (P&lt;0.001)</td>
<td>73% (58, 87)</td>
</tr>
<tr>
<td>LMN (Lower Incisor to Mandibular plane)</td>
<td>8.7 (P&lt;0.001)</td>
<td>79% (68, 91)</td>
</tr>
<tr>
<td>L/L (Inter-incisal angle)</td>
<td>9.3 (P&lt;0.001)</td>
<td>95% (70, 91)</td>
</tr>
<tr>
<td>MMPA (Maxilla-mandibular plane angle)</td>
<td>5.0 (P&lt;0.001)</td>
<td>67% (50, 84)</td>
</tr>
<tr>
<td>LFH (Lower anterior facial height)</td>
<td>4.8 (P&lt;0.001)</td>
<td>65% (48, 83)</td>
</tr>
<tr>
<td>LLAPO (Lower incisor point to APog line)</td>
<td>5.3 (P&lt;0.001)</td>
<td>68% (51, 85)</td>
</tr>
<tr>
<td>LLNPO (Lower incisor point to NPog line)</td>
<td>8.1 (P&lt;0.005)</td>
<td>56% (34, 77)</td>
</tr>
<tr>
<td>AOBO (Functional Occlusal Plane to A and B points)</td>
<td>4.0 (P&lt;0.001)</td>
<td>60% (41, 80)</td>
</tr>
</tbody>
</table>

### Table 2 Analysis of variance with random effects for digital tracings and between-case range

<table>
<thead>
<tr>
<th>Cephalometric variable</th>
<th>ICC (95% CI)</th>
<th>Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (Sella-Nasion to A point)</td>
<td>6.7 (P&lt;0.001)</td>
<td>74% (61, 88)</td>
</tr>
<tr>
<td>SNB (Sella-Nasion to B point)</td>
<td>11.3 (P&lt;0.001)</td>
<td>84% (75, 93)</td>
</tr>
<tr>
<td>ANB</td>
<td>2.8 (P&lt;0.001)</td>
<td>95% (23, 71)</td>
</tr>
<tr>
<td>UMX (Upper incisor to Maxillary plane)</td>
<td>4.8 (P&lt;0.001)</td>
<td>65% (48, 83)</td>
</tr>
<tr>
<td>LMN (Lower Incisor to Mandibular plane)</td>
<td>6.8 (P&lt;0.001)</td>
<td>74% (61, 88)</td>
</tr>
<tr>
<td>L/L (Inter-incisal angle)</td>
<td>10.0 (P&lt;0.001)</td>
<td>82% (72, 92)</td>
</tr>
<tr>
<td>MMPA (Maxilla-mandibular plane angle)</td>
<td>9.8 (P&lt;0.001)</td>
<td>81% (71, 92)</td>
</tr>
<tr>
<td>LFH (Lower anterior facial height)</td>
<td>2.1 (P&lt;0.005)</td>
<td>36% (9, 63)</td>
</tr>
<tr>
<td>LLAPO (Lower incisor point to APog line)</td>
<td>7.3 (P&lt;0.001)</td>
<td>76% (63, 89)</td>
</tr>
<tr>
<td>LLNPO (Lower incisor point to NPog line)</td>
<td>14.0 (P&lt;0.001)</td>
<td>87% (79, 94)</td>
</tr>
<tr>
<td>AOBO (Functional Occlusal Plane to A and B points)</td>
<td>5.4 (P&lt;0.001)</td>
<td>69% (53, 85)</td>
</tr>
</tbody>
</table>

### Table 3 Cephalometric data of study sample and ‘Eastman’ norms

<table>
<thead>
<tr>
<th>Cephalometric variable</th>
<th>Study sample</th>
<th>‘Eastman’ norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (Sella-Nasion to A point)</td>
<td>84.8 ± 4</td>
<td>82 ± 3</td>
</tr>
<tr>
<td>SNB (Sella-Nasion to B point)</td>
<td>81.4 ± 4</td>
<td>79 ± 3</td>
</tr>
<tr>
<td>ANB</td>
<td>3.4 ± 1.4</td>
<td>3 ± 1</td>
</tr>
<tr>
<td>LMN (Lower Incisor to Mandibular plane)</td>
<td>91.65 ± 6</td>
<td>92.5 ± 5</td>
</tr>
<tr>
<td>UMX (Upper incisor to Maxillary plane)</td>
<td>111.5 ± 6</td>
<td>108 ± 5</td>
</tr>
<tr>
<td>L/L (Inter-incisal angle)</td>
<td>131.5 ± 8</td>
<td>133 ± 10</td>
</tr>
<tr>
<td>MMPA (Maxilla-mandibular plane angle)</td>
<td>25.3 ± 5.5</td>
<td>27 ± 5</td>
</tr>
<tr>
<td>LFH (Lower anterior facial height)</td>
<td>56.5 ± 2</td>
<td>52.5 ± 2.5</td>
</tr>
</tbody>
</table>

### Observations

Several measurements of our class I sample differed significantly from the ‘Eastman Standard’. Secular trends have been described before. Changes in craniofacial morphology were also found in a cephalometric superimposition study comparing parents, their children and siblings. A study with a larger sample size could be used to investigate this further. Regarding the time difference between both methods, we did not take into account preparation time needed before tracing commences. This comprises of uploading, printing and mounting of radiographs on a light box for manual tracing and uploading and transferring images for computerised tracing. In a practice environment, factors relating to preparatory work may be more or less time consuming, depending on workflow arrangements. Another major advantage of the computerised over manual tracing is the simplicity with which different cephalometric analyses can be obtained, whereas for manual tracing this takes much longer, depending on the points/planes previously charted. In summary, both hand tracing and Dolphin® were found to have good repeatability. Method error between lateral cephalometric films traced by hand and computer (Dolphin®) was generally very good. Time of tracing was significantly reduced with the computerized method. The Class I sample of this investigation differed significantly from the ‘Eastman Standard’.

### Recommendations

1. Computerised tracings of lateral cephalograms can be recommended as outcomes were comparable to traditional hand tracing techniques.
2. The technique is also more efficient for digital tracing but a re-audit is recommended for confirmation.
3. New cephalometric norms should be established to better represent contemporary population norms.
4. Re-audit is planned in 24 months after update of the computer software.
Project involvement
Miriam Bouchiba (Data collection, manuscript drafting)
Nora Donaldson (Statistics and data collection)
Stephanie Oiknine (Data collection, manuscript drafting)
Dirk Bister (Project lead, project design, manuscript drafting and approval)

References
Three cycle audit of the quality of digital lateral cephalogram radiographs

Lauren Hardwick (ST) and Mark Sayers (Consultant)
Queen Mary’s Hospital, Sidcup, King’s College Hospital NHS Foundation Trust

Background/rationale
A standardised technique for taking lateral skull radiographs was first reported by Pacini in 1922 and popularised by both Broadbent and Hofrath respectively. These radiographs provide information on the facial skeleton, soft tissues, dentition, pharynx and cervical vertebrae. Lateral Cephalogram radiographs provide a tool for patient information sharing and to aid the consent process. They are also used to plan treatment and appraise both treatment progression and results. A previous audit at Queen Mary’s Hospital, Sidcup (QMS) in 2011 investigated the quality of lateral cephalogram radiographs in a three-audit cycle. The results showed that the quality of radiographs improved with the implementation of two educational seminars after each of the first two audit cycles with radiographers and orthodontic clinicians. Unfortunately, due to the reorganisation of healthcare in the South East London region, it was noticed that the quality of lateral cephalogram radiographs has since deteriorated.

Aims and objectives
The aim of this audit was to determine the quality of digital lateral cephalogram radiographs in relation to the following criteria: correct head posture, the presence of identifiable cephalometric landmarks (both hard and soft anatomical tissues) and the suitability of the image for orthodontic treatment planning, including ruler inclusion.

Standards/guidelines/evidence base
Both the National Radiological Protection Board (NRPB) standards and the results of the previous audit were used as a means of constructing the audit standards. As a department the following standards were agreed upon: 90% anatomical (hard and soft tissue) landmarks should be visible and 90% radiographs should be of good enough quality to allow orthodontic treatment planning.

Sample and data source
This audit was carried out within the orthodontic department at Queen Mary’s Hospital, Sidcup at three separate time periods: 1st September 2013 - 30th November 2013 (cycle 1), 1st September 2014 - 30th September 2014 (cycle 2) and 1st April 2015 - 30th April 2015 (cycle 3). All lateral cephalogram radiographs taken within these time periods were analysed. Cycle one was carried out over a 3-month period to reflect the reorganisational changes that the trust underwent during this period. In total 270 lateral cephalograms were included in this audit: cycle 1 (184), cycle 2 (37) and cycle 3 (49).

Audit type
Retrospective

Methodology
The radiographs were viewed on the PACs (Picture Archiving and Communication system) and analysed by a single operator using the following criteria:

- Diagnostic purposes: (correct head positioning)
- Identifiable anatomical landmarks visible: cranial base (Sella, Nasion, Basion, articularare, external auditory meatus), facial skeleton (Orbitale, Porion, Anterior Nasal Spine, posterior nasal spine, prosthion, A point, B point, pogonion, menton, gnathion, gonion, condylion), soft tissue (Soft tissue glabella, soft tissue nasion, nose tip, pronasale, subnasale, labrale superius, upper lip, stomium superius, lower lip, stomium inferius, labrale inferius, soft tissue pogonion, soft tissue menton) and dental structures (Teeth in maximum intercuspation, upper incisor root apex and crown, lower incisor apex and crown, upper first molar crown and root apices, lower first molar crown and apices)
- Quality: (Sufficient quality to allow orthodontic treatment planning, i.e. including a ruler and number of lateral cephalogram radiographs re-taken due to positioning errors)

Findings
Diagnostic purposes
During the three cycles of this audit there was variation in the correct head positioning assessed from the lateral cephalograms: cycle 1 (59%), cycle 2 (91%) and cycle 3 (78%). Thus, an improvement in the correct head positioning when taking lateral cephalograms is desired.

Identifiable anatomical landmarks
Overall the cranial base landmarks were identifiable in all three audit cycles. Identification of Articulare, improved from 90% in cycle 1 to 100% in cycles 2 and 3. In regards to facial skeletal landmarks ANS, PNS, Prosthion and Point A were the most difficult points to identify (Table 1). There was an improvement in cycle 2, with deterioration in cycle 3. In the first cycle, 95% of all soft tissue landmarks were identifiable, except for soft tissue menton and throat point. There was an improvement in the identification of these landmarks in cycle two. This was not maintained in cycle three. Dental structures were generally identifiable (Table 2). Teeth in maximum intercuspation improved in cycle 2 and cycle 3 compared to cycle 1.
Table 1 Skeletal landmarks visible on digital lateral cephalogram radiographs

<table>
<thead>
<tr>
<th>Skeletal Landmarks</th>
<th>2013 Cycle 1</th>
<th>2014 Cycle 2</th>
<th>2015 Cycle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Orbitale</td>
<td>92</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Pison</td>
<td>92</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>ANS</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>PNS</td>
<td>83</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>Prosthion</td>
<td>72</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Point A</td>
<td>54</td>
<td>46</td>
<td>100</td>
</tr>
<tr>
<td>Point B</td>
<td>93</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>Pogonion</td>
<td>97</td>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>Menton</td>
<td>96</td>
<td>4</td>
<td>97</td>
</tr>
<tr>
<td>Gnathion</td>
<td>97</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Gonion</td>
<td>99</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Condylion</td>
<td>96</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2 Dental structures visible on digital lateral cephalometric radiographs

<table>
<thead>
<tr>
<th>Dental Structures</th>
<th>2013 Cycle 1</th>
<th>2014 Cycle 2</th>
<th>2015 Cycle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Teeth in maximum intercuspation</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Permanent upper central incisor 1) Crown</td>
<td>96</td>
<td>44</td>
<td>100</td>
</tr>
<tr>
<td>2) Root</td>
<td>74</td>
<td>26</td>
<td>97</td>
</tr>
<tr>
<td>Permanent lower central incisor 1) Crown</td>
<td>91</td>
<td>9</td>
<td>97</td>
</tr>
<tr>
<td>2) Root</td>
<td>78</td>
<td>22</td>
<td>97</td>
</tr>
<tr>
<td>Permanent upper first molar 1) Crown</td>
<td>90</td>
<td>10</td>
<td>97</td>
</tr>
<tr>
<td>2) Root</td>
<td>83</td>
<td>17</td>
<td>97</td>
</tr>
<tr>
<td>Permanent lower first molar 1) Crown</td>
<td>89</td>
<td>11</td>
<td>97</td>
</tr>
<tr>
<td>2) Root</td>
<td>88</td>
<td>12</td>
<td>97</td>
</tr>
</tbody>
</table>

Figure 1 Percentage of lateral cephalogram radiographs deemed sufficient for treatment planning purposes

Quality

During the three cycles of this audit the number of lateral cephalogram radiographs re-taken due to positioning errors increased slightly from 1% (cycle 1) to 6% (cycle 3). The percentage of radiographic images deemed sufficient for treatment planning purposes improved in cycle 2 but deteriorated in cycle 3 but not to the level of cycle 1 (Figure 1). The audit standard was not met. A ruler was present in 98% (cycle 1), 100% (cycle 2) and 92% (cycle 3) of lateral cephalogram images.

Observations

The results reveal that the audit standard for lateral cephalogram radiographs was not being met. A 100% standard may never be achieved due to technical/human error i.e. positioning error. Furthermore, a wide inter-individual variation in judging/assessing lateral cephalogram radiographs has been reported which confirms how difficult it is to correctly produce a standardised and reproducible image. The changes in radiograph quality at the dental extremities can be attributed to potential positioning and contrast errors. The reason for poor positioning could be because the radiographers in the department are not dental radiographers. Before cycle 2 radiology staff had training in taking lateral cephalogram radiographs. The aim of this training was to explain and demonstrate the orthodontic department’s requirements for a diagnostic lateral cephalogram radiograph. This led to an improvement of radiograph quality in cycle 2. However, in the third cycle, there had been high staff turnover within the radiology department with new staff members who had not received the same training given to the previous team. This may have led to a decline in the third cycle.

Recommendations

1) Education and / or feedback to radiology staff highlighting desired cephalometric points and correct patient head positioning to be arranged.
2) Feedback will be given to clinical managers.
3) Re-audit in 12 months.

Acknowledgements

The authors would like to acknowledge Beatrix Summerfield, RIS/PACS Manager and Bradley Smith, Imaging Services Manager (RA Sponsor), Queen Mary’s Hospital Sidcup, Dartford and Gravesham NHS Foundation Trust, for accessing the radiographs required for this audit.

Project involvement

Lauren Hardwick (Project design, data collection, manuscript drafting)
Mark Sayers (Project lead and approval of manuscript)

References

An audit to assess the impact of electronic patient records on new patient clinics

Adam Jowett (Specialty Dentist), Zynab Jawad (ST), Harmeet Dhaliwal (Consultant), Trevor Hodge (Consultant) and Claire Bates (Consultant) 
Leeds Teaching Hospital NHS Trust

Background/rationale
Information and records management is an important aspect of clinical governance. The efficient operation of paper and electronic patient record (EPR) systems is fundamental to patient care. The Leeds Dental Institute (LDI) switched from traditional paper based records to EPR in January 2015. Now, all patient information is stored and recorded using an EPR system. One of the reported benefits of this particular EPR system is an increase in workflow efficiency. An audit was therefore designed to review the purported benefits of workflow efficiency, in particular focusing on the time taken to carry out an orthodontic history and examination using EPR, when compared with traditional paper based methods.

Aims and objectives
The aim of this audit was to assess the impact of a new EPR system on the efficiency of orthodontic new patient assessment clinics at the Leeds Dental Institute. The objectives of the audit were to: establish a gold standard for the time taken for an orthodontic new patient history and examination, ascertain whether EPR systems are more efficient than traditional paper based systems and identify any unforeseen problems with EPR systems.

Standards/guidelines/evidence base
A detailed history and examination is the most important and the most time-consuming aspect of a new patient assessment, and as a result the smooth running of the new patient clinic is dependent on the efficiency of establishing this information. There are currently no written guidelines that state the recommended duration of a dental or orthodontic new patient history and examination. Our gold standard was based on the fact that new patient appointments at the LDI are currently set at 15 minute intervals. It was decided by an agreed consensus of orthodontic consultants that based on this 15-minute appointment slot, 100% orthodontic history and examinations should not exceed 10 minutes. This allows time for requesting radiographs, patient discussion and treatment planning.

Sample and data source
This audit was carried out within the orthodontic department at the Leeds Dental Institute at the following time points: 1st October - 10th December 2014 (prior to implementation of EPR), 14th January - 10th March 2015 (immediately following the implementation of EPR) and 1st July - 20th August 2015 (6 months post-implementation of EPR). Data was collected at these time points and was based on the findings from the ‘Good practice guidelines for GP electronic patient records’. In total, data was collected for 150 patients (50 consecutive patients per data collection time points), attending two independent orthodontic consultant new patient clinics.

Audit type
Prospective

Methodology
A data collection sheet was used to collect all the relevant information. To ensure consistency, eliminate bias and minimise the disturbance to operating students, staff and patients, a number of factors were kept constant. These included; both the clinician and assistant being present to allow the recording of patient information, timings to be carried out by a third person, ensuring that the stopwatch is started only once the patient is seated and the examining clinician begins speaking to the patient and stopped once all components of the history and examination have been completed. For recording of EPR, only assistants who have undertaken EPR training recorded EPR data. Computer faults and other interruptions were recorded in the notes section on the data collection sheet.

Findings
Figure 1 shows that it initially took almost twice as long to complete a history and examination using EPR when compared to paper based records. The time taken to complete a history and examination reduced between the initial EPR results and 6 month re-audit however, this was following a 6 month period of familiarisation with the EPR system and some implemented changes. The implemented changes (following initial EPR results) included: an increased number of nursing staff on the clinic, a reduced number of drop down menus and the implementation of customised pathways for the orthodontic assessment. Although there was a significant reduction between the initial EPR results and 6 month re-audit, the time taken was still significantly greater than that for paper based records.
Observations

A number of recurring issues were reported following the initial EPR data collection. These were recorded in the ‘additional information’ part of the data collection sheet. Comments included the following; paper based notes not available, nursing support not available, computer crashing, information technology support required, and information recorded initially on paper and later uploaded to EPR. In the second cycle (after 6 months) there were 8 individual cases where the history and examination had been recorded initially on paper, and later scanned onto EPR as an additional document. This highlights that the EPR is not always being used to record the history and examination, but that clinicians were using the paper assessment sheets to record the information, which was then sent for scanning on to the EPR system.

One advantage of using EPR is the eliminated risk of clinics being delayed or cancelled if paper based records are unavailable. The introduction of EPR has successfully addressed the issue of missing notes but other problems have resulted. These included a reduction in patient numbers on new patient clinics (clinic capacity was reduced by 60% in anticipation of EPR), archiving of paper based notes (the paper based notes of patients seen previously and then discharged are not always available), and radiographs included with paper-based referrals are scanned into EPR and archived (the quality of scanned radiographs are variable). Another important consideration is the accessibility of important patient information potentially hindered by the use of computers, usernames and passwords which may impact on how quickly information can be made available in a medical emergency. These are potentially serious issues relating to clinical governance and patient safety.
**Recommendations**

1) Results for the re-audit data collection cycle were collated and presented at the Yorkshire orthodontic regional audit group meeting.

2) Suggestions made as a result of the deficiencies highlighted included; a streamlined ‘express pathway’ for orthodontic assessments, increase in the number of nursing staff on the clinic and the utilisation of quick notes and customised screens.

3) Following the implementation of the suggestions a re-audit is planned in 6 months’ time following the next EPR system update.

4) A new audit has been established to review the recording of medical histories and in particular medical alerts on the EPR software.

**Acknowledgements**

The authors would like to thank the following members of nursing staff who helped collect the data for this audit: Angela Elvin, Jade Asquith, Jemma Pedley, Zoe Thornton, Celline Gunson, and Karen Gadsby.

**Project lead and other staff members involved**

Adam Jowett (Project lead, data collection and analysis, presentation of findings and implementation of action plan)

Zynab Jawad (Project design, data collection and analysis)

Harmeet Dhaliwal (Project design and approval of manuscript)

Trevor Hodge (Project design and approval of manuscript)

Claire Bates (Project design, implementation of action plan and approval of manuscript)

**References**


Re-audit of patient satisfaction with orthodontic-orthognathic treatment

Daniel Gillway (LDFT), Kulraj Achal (ST), Jay Kindelan (Consultant) and David Morris (Consultant)
York District Hospital NHS Foundation Trust and Leeds Dental Hospital NHS Foundation Trust

Background/rationale Orthognathic patients present with complaints of dissatisfaction with regard to their facial or dental appearance and function. It is estimated that approximately 250,000 patients would benefit from having orthognathic surgery in the UK. A combination of fixed orthodontic appliances and surgery is required to correct severe jaw discrepancies. The main indications for this treatment are significant skeletal disproportions that are not amenable to correction by orthodontic camouflage means. It is vital to assess patient satisfaction to help provide a patient-centred service and improve the provision of care. The results are also informative to NHS commissioning boards regarding treatment outcomes of the service they are purchasing for the local community. A previous audit conducted within our department reported that 93% patients received leaflets on braces and 95% regarding surgery. 98% patients would recommend the treatment they had to other people in their situation. The standards used were based on the results of the previous audit. Changes implemented from the previous audit included: modifications to pre-operative patient information and adaption of the questionnaire to assess usage of the BOS orthognathic surgery DVD.

Aims
The aim of this audit is to assess patient satisfaction following orthognathic treatment in North Yorkshire and Leeds and to determine if patients are provided with sufficient information prior to the procedure.

Standards/Guidelines/Evidence base
90% or more of patients receiving orthognathic treatment are satisfied with the outcome they have received and 100% patients receive adequate information regarding orthognathic treatment and feel fully informed prior to surgery.

Sample and Data Source
This audit was carried out within the orthodontic departments at Leeds and North Yorkshire hospitals between 1st February 2013 to 31st January 2015. Patients who had completed their orthognathic treatment within the last two years were invited to participate. The questionnaire aimed to record demographic data, reasons for orthognathic treatment, the information provided, benefits of treatment and satisfaction with surgical-orthodontic treatment.

Audit Type
Prospective

Methodology
The questionnaire used was based on the BOS orthognathic questionnaire with recommendations from the previous audit. An electronic platform (Survey Monkey™) was chosen for distribution of the questionnaire following completion of treatment. Patients were invited to fill in the questionnaire at their joint orthognathic clinic appointment for review 1 year after surgery and 2 years after debonding of fixed appliances. An isolated clinical bay was used to give the patient privacy while filling out the questionnaire and all patients were informed that the survey was completely anonymous. The data was then analyzed using a MS Excel package.

Findings
A total of 110 patients (74 Leeds and 36 York), completed the on-line survey, no patients refused to complete the questionnaire giving an overall response rate of 100%. The majority of patients (73% n=80) were aged between 18 and 29 years with a higher proportion of females (62% n=68) than males. The majority of surgical procedures undertaken were bimaxillary osteotomies (70% n=77) followed by mandibular only procedures (16% n=18).

<table>
<thead>
<tr>
<th>Pre-operative Information</th>
<th>Fully Informed about: (n=110)</th>
<th>Strongly agree (%)</th>
<th>Agree (%)</th>
<th>Undecided (%)</th>
<th>Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braces</td>
<td>73.6</td>
<td>24.6</td>
<td>0</td>
<td>1.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Surgery</td>
<td>70.0</td>
<td>25.5</td>
<td>0</td>
<td>2.7</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Change in facial appearance</td>
<td>62.7</td>
<td>27.3</td>
<td>2.7</td>
<td>5.5</td>
<td>1.8</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Patient responses to pre-operative information

Pre-operative Information
Information leaflets on fixed appliances were received by 97% (n=107) of patients with 96% (n=106) of them finding these leaflets useful. However, only 30% (n=33) of patients watched or received the BOS Orthognathic DVD provided, this may partly be due to lack of access or the patients not wishing to view the film. Table 1 shows patient responses to how fully informed they were regarding the three different categories.

Motivation for Surgery
The reasons patients reported for initially seeking treatment can be found in Table 2. The majority of patients were keen to undergo treatment for reasons of self-confidence, facial appearance, to straighten their teeth and improve their smile.
Reasons For Treatment (n=110)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strongly Agree (%)</th>
<th>Agree (%)</th>
<th>Undecided (%)</th>
<th>Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Confidence</td>
<td>71.8</td>
<td>22.8</td>
<td>2.7</td>
<td>2.7</td>
<td>0</td>
</tr>
<tr>
<td>Facial Appearance</td>
<td>77.3</td>
<td>17.3</td>
<td>3.6</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Smile</td>
<td>82.7</td>
<td>14.6</td>
<td>2.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Social Life</td>
<td>39.0</td>
<td>17.3</td>
<td>24.5</td>
<td>12.7</td>
<td>6.5</td>
</tr>
<tr>
<td>Straight teeth</td>
<td>85.4</td>
<td>13.7</td>
<td>0.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prevent future problems</td>
<td>59.1</td>
<td>22.7</td>
<td>17.3</td>
<td>0.9</td>
<td>0</td>
</tr>
<tr>
<td>Eating ability</td>
<td>45.5</td>
<td>14.5</td>
<td>19.1</td>
<td>12.7</td>
<td>8.2</td>
</tr>
<tr>
<td>Speech</td>
<td>27.3</td>
<td>11.8</td>
<td>25.5</td>
<td>22.7</td>
<td>12.7</td>
</tr>
</tbody>
</table>

Table 2 Patient responses on motivation for treatment

Patient Satisfaction
The treatment would be recommended by 99% (n=109) of our patients to other people in their situation. The reported benefits of treatment mirrored the reasons why patients underwent treatment. 98% patients (n= 108) would recommend the hospital they had their treatment at to friends and family. 34% (n=37) patients had their surgery cancelled or moved to another date and 16% (n=18) required a second operation following their initial surgery.

Table 3 displays the number of patients reporting problems post-operatively. 90% or more of patients did not report significant difficulty eating or dental problems as a complication of the treatment. However, this is not true of altered sensation (numbness). The questionnaire allowed patients to comment on areas they felt could be improved upon. Common responses included dissatisfaction with the lack of out of hours specialist orthodontic cover and short notice cancellations of surgery. Patients left positive comments relating to the duration and quality of follow-up they received, and also the general support and information received from staff. The standard for patient satisfaction has been met and the patient information target was consistently over 90% in the different categories. However, it did not quite reach the standard set of 100%.

Post-Operative Problems (n=110)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Strongly Agree (%)</th>
<th>Agree (%)</th>
<th>Undecided (%)</th>
<th>Disagree (%)</th>
<th>Strongly Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty eating</td>
<td>3.6</td>
<td>3.6</td>
<td>1.8</td>
<td>39.1</td>
<td>51.9</td>
</tr>
<tr>
<td>Numbness</td>
<td>12.7</td>
<td>37.3</td>
<td>10.0</td>
<td>19.1</td>
<td>20.9</td>
</tr>
<tr>
<td>Dental Problems</td>
<td>0</td>
<td>2.7</td>
<td>6.4</td>
<td>46.4</td>
<td>44.5</td>
</tr>
</tbody>
</table>

Table 3 Patient responses to problems with treatment post-operatively

Observations
The previous audit found that 93% of patients had received leaflets about braces and 95% on surgery. In addition, 98% patients would recommend the treatment they had to others in their situation. It is encouraging to see that over 90% patients reported to be fully informed on; wearing braces, the surgery involved and the changes to facial appearance. The DVD had a low viewing rating of 30%. This was due to a number of factors including; patients not wishing to view the film for reasons of anxiety and lack of staff access to copies of the DVD. A change of format is planned to increase access. With regard to motivation for treatment, the reasons patients reported undergoing treatment included improving self-confidence 95% (n= 104), changing facial appearance 95% (n=104), improving their smile 97% (n=107) and straightening teeth (99% n=109). Changes to social life, prevention of further problems, eating ability and speech were lower with 56% (n=62), 81% (n=90), 60% (n=66) and 30% (n=43) respectively agreeing or agreeing strongly. The overall satisfaction with treatment was high; both with the surgery and the overall hospital's treatment of them. The 100% standard for all patients receiving leaflets and information was not achieved (97%). A correlation between high satisfaction levels and the information provided despite post-operative symptoms has been previously reported. Post operatively only 9.1% (n=10) of patients reported dental problems or eating difficulties. A higher proportion "agreed or were undecided" about numbness post-operatively at 50% (n=55). Numbness and altered sensation is a known complication of orthognathic surgery and patients are consented for this prior to treatment. This questionnaire was designed to be patient-centred and patient specific to ensure there is a holistic approach to managing orthodontic patients within our region. It is clear from the results that, in addition to functional issues, psychological needs were significant motives for seeking orthognathic treatment. With the advent of the IOFTN, there is a risk of excluding some patients with a significant psychological need for treatment. Perhaps additional indices should be developed to complement or supplement the IOFTN to ensure that patients with functional and psychological concerns are appropriately managed.
Recommendations
1) Our “gold standard” target for patient satisfaction has been met.
2) The patient information target was consistently over 90% in the different categories. However, it did not quite reach the standard set of 100%
3) Comments from patients were very positive. Areas to improve include providing consistent information for all our patients in both leaflet and visual format.
4) Make prospective patients aware of the BOS orthognathic video clips once available on-line.
5) Continuation of data collection prospectively and longitudinally. To consider the use of a tablet format in the clinic/waiting area to improve survey uptake even further.
6) Pre-operative information amended, for example to inform patients that there is ‘out-of-hours’ cover available but it is not specialised to orthodontics.
7) Re-audit of regional data is planned for January 2017.

Project involvement
Daniel Gillway (Data collection and manuscript drafting)
Kulraj Achal (Data collection and manuscript drafting)
Jay Kindelan (Project lead, project design, data collection and approval of manuscript)
David Morris (Project design, data collection and approval of manuscript)

References
An audit to assess the diagnostic value of the horizontal parallax technique using periapical radiographs for localising ectopic maxillary canines

Aliza Jesani (Post CCST), Susan O’Connell (ST) and Sheena Kotecha (Consultant)
Birmingham Dental Hospital

Background/rationale Maxillary canine teeth are the second most commonly impacted tooth in the dental arch after the third molar with a prevalence 1.7%1. Accurate radiographic assessment of the impacted canine by the orthodontist is essential in evaluating the difficulty of aligning the tooth and treatment planning. It ensures that patients can be offered all the feasible treatment options as part of the informed consent process and that the most appropriate intervention is recommended, for example extraction of the deciduous canine, removal of the impacted canine or alignment. In the latter cases, accurate localisation aids treatment, ensuring correct vector application during alignment and potentially reducing iatrogenic damage to adjacent teeth. From a surgical viewpoint, accurate determination of canine position assists in planning the surgical approach. The position of an unerupted canine tooth is most often assessed using the parallax technique2. Keur 7 advocated the use of two anterior occlusal radiographs using a horizontal shift to determine the position of an unerupted canine. Jacobs supported this stating that the degree of tube shift possible is greater with occlusal radiographs and that the full canine was more likely to be captured, aiding localisation3.

Aims and Objectives
The primary aim of this audit was to determine whether periapical radiographs used in the horizontal parallax technique to localise ectopic maxillary canines (EMCs) are of high quality and diagnostic value. Additional aims included to assess if the position of the EMCs can be determined from the parallax views available.

Standards/guidelines/evidence base
The National Radiology Protection Board (NRPB) guidelines4 were used to assess image quality using the following grading: grade 1 (ideal: no errors of positioning, exposure or processing), grade 2 (diagnostically acceptable: errors present but diagnostic utility of image not affected) and grade 3 (unacceptable: errors present which render the image unacceptable). The standard set for image quality by the NRPB is no less than 70% images should be grade 1; no more than 20% grade 2 and no more than 10% grade 3. After a discussion within the orthodontic and radiology departments, it was agreed best practice would entail the presence of the tip and crown of the EMC along with the root of the adjacent tooth on all (100%) radiographs. In addition, no more than two periapical radiographs should be required to identify the EMC using the horizontal parallax technique in 100% cases.

Sample and data source
The radiology logbook at Birmingham Dental Hospital was used to obtain the identification number of 50 consecutive EMCs, for which horizontal parallax (two periapical radiographs) had been requested between 2nd March and 29th May 2015.

Audit type
Retrospective

Methodology
The radiographs were examined for quality, diagnostic value and ability to localise the EMC using horizontal parallax. Each radiograph was assessed independently by an orthodontic specialist trainee and a post CCST under standardised viewing conditions in the radiology department. Any disagreements regarding the scoring of the radiographs were resolved by discussion between the two assessors.

Findings
Of the 50 EMCs, 18% had more than the ideal number of two radiographs taken. Out of these, 14% had three radiographs taken and 4% had four or more radiographs taken. The gold standard of two radiographs per canine was not met. In relation to the National Radiology Protection Board Guidelines (NRPB), 51% the radiographs had a quality rating of 1 (Table 1). This is lower than the standard required of “no less than 70%”. Only 32% were deemed diagnostically acceptable and achieved a quality rating of 2. This did not meet the NRPB standard of “no more than 20%”. Seventeen per cent scored a rating of 3. Overall, the NRPB guideline standards were not met.

Figure 1 Quality of periapical radiographs (PAs)

Only 62% of radiographs contained the essential reference points of the tip of canine, canine crown and root of adjacent tooth. In a third of cases (32%), it was not possible to localise the canine. The standard was not met.
Localisation of EMCs

Observations

It was apparent that multiple radiographs were taken due to inadequate quality. In most cases, the essential reference points were not fully visible on the film due to positioning error. A typical example of this was when the tooth under investigation had been coned off. This could have been due to radiographer positioning error or due to patient movement after being placed in the correct position. The Birmingham Dental Hospital radiology department trains radiologists and dental students. This may explain why the quality of radiographs was below the NRPB standards. In this audit, it was only possible for the registrars to make a decision regarding the bucco-lingual position in approximately two thirds of the cases using the periapical radiographs alone due to poor radiograph quality, lack of essential reference points and inadequate tube shift. All cases did however have a DPT radiograph, which in combination with the periapical radiographs and clinical examination would have helped to localise the EMCs if using the vertical parallax method. The reliability of the horizontal and vertical parallax technique for the localisation of impacted canines has been reported. The position of the impacted canine was correctly identified in 83% cases with horizontal parallax compared to 68% cases with vertical parallax. Conversely, retrospective analysis suggests that the diagnostic value of vertical parallax was higher. The use of two upper standard occlusal radiographs for the horizontal parallax technique has been proposed. This was felt to be advantageous because a larger tube shift can be obtained between the exposures thereby giving a larger shift of the image of an impacted tooth. Furthermore, the impacted tooth is shown in its entirety along with adjacent structures. Although these films are easier to position, they can produce a distorted view. They have a tendency to depict the EMCs higher than they are when they are located closer to the apices of the incisor teeth. The effective dose of radiation for two periapical radiographs and two upper standard occlusal radiographs is the same (<1.5 micro Sierverts) at the Birmingham Dental Hospital where standard protocol is to use a thyroid shield during occlusal radiography. The findings of this audit would only be applicable to those units that currently use two periapical radiographs to localise EMCs with horizontal parallax. Some units may not have the ability to take occlusal views.

Recommendations

1) The results are to be disseminated locally and regionally.
2) All operators taking radiographs shall receive an update on training on the parallax technique.
3) This audit is to be repeated prospectively in 12 months. The horizontal parallax technique will be reviewed accordingly. If the results indicate lack of adequate tube shift, then consideration will be given to utilising either the vertical parallax technique or the horizontal parallax with two upper standard occlusal radiographs.

Acknowledgements

The authors wish to acknowledge the Radiology department at Birmingham Dental Hospital for their assistance with the audit. In addition, we would like to thank Mr John Rout (Consultant in Oral and Maxillofacial Surgery) for his contribution.

Project involvement

Aliza Jesani (Project design, data collection, manuscript drafting)
Susan O’Connell (Project design, data collection, manuscript drafting)
Sheena Kotecha (Project lead and approval of manuscript)

References

Northern region patient satisfaction audit: 4th round

Sarah Germain (Post CCST)1,2 and Sally Walker (Consultant Orthodontist)1
Cumberland Infirmary, Carlisle1 and Newcastle Dental Hospital2

Background/rationale
Improving Patient Experience has been an important goal of NHS England and there is an increase in use of Patient Related Evaluation Measures (PREMs). There have been several cycles of The Northern Region Patient Satisfaction Questionnaire which was first implemented in 20111,2,3,4. Participation has increased with each round and the questionnaire developed following user feedback. The use of The NHS Friends and Family Test was introduced to primary care dental services in April 2015 and although no standard has been set it provides a useful feedback tool to compare performance both locally and nationally6.

Aims and Objectives
The aims of this audit were to assess the level of patient satisfaction with provision of orthodontic treatment and to identify areas for improvement in the provision of orthodontic care in the Northern Region. A NHS friends and family test was to be completed for each unit.

Standards/guidelines/evidence base
The standards adopted were those used in previous rounds of the regional patient satisfaction audit1,2,3,4. There was a greater than 90% positive response to each question and a greater than 95% average positive response.

Audit type
Prospective

Sample and data source
NHS orthodontic providers in The North East of England and Cumbria were invited to participate in the regional audit project. All units were asked to give questionnaires to consecutive patients currently receiving orthodontic treatment. Data collection started in March 2015 with a deadline for submission to the regional audit co-ordinator 1st August 2015.

Methodology
Several rounds of the audit had been held in the Northern region previously1,2,3,4. Increased participation in each round meant data could not realistically be collated manually. For this round of the audit a computer readable form was generated (Figure 1). Questions had previously been developed from The NHS outpatient questionnaire6. Questions were also revised to simplify and condense the data collection form. Additional questions, asking about the provision of written material and which member of the team provided care, were included. The revised questionnaire was discussed at the regional audit meeting with further modifications made following suggestions from the group. Figure 1 Computer Readable data collection form.

Findings
Twenty-eight practices and hospital departments were registered to participate, 20 of which returned data prior to the set deadline of 1st August 2015. This included 4 hospital departments, 13 specialist orthodontic practices and 3 general dental practices. Geographically 6 units were based in Cumbria, 6 in Tyneside or Northumberland and 8 in Teesside and North Yorkshire. The number of responses per unit ranged from 4 to 206. A total of 1265 questionnaires were returned, 37 of which did not have a unit identification number. Fifty-one questionnaires had at least one unanswered question. Due to data collection occurring in multiple locations it is not known if, and how many, patients declined to participate.

Table 1 shows the positive response rate to each individual question. Scores highlighted in red are below the set standard of 90% positive response. Those highlighted in yellow are between 90 and 95% positive response rate and may contribute to a unit not meeting the mean overall positive response of 95%. Unit 19 responses were omitted due to the minimal number of returned questionnaires. All units met the required standard of a 90% positive response to questions 1,2,3,6,7,8 and 10. A less than 90% positive response rate was achieved by several units for questions 4,5,11 and 14. These relate to: a choice of appointment time, waiting more than 15 minutes or not receiving an apology for such a delay, provision of written information and ease of access to the practice or department. Two units did not achieve the set standard of > 95% average positive response. The mean positive response rate for specialist practices was 96.8 and for hospital departments 96.6. Eight units met all standards set. Twelve units in total had at least one area of practice below the set standard of 90% and 2 units did not meet the average positive response rate of 95%.

Table 1 Mean Positive Response Rate with scores below the set standard highlighted in red and those less than 95% highlighted in yellow
The friends and family test scores are presented in Table 2. 97.5% of patients would recommend the regional orthodontic services and 0.7% would not. The regional net promoter score (NPS) was 76.8. Individual providers’ results were available and used for the appraisal process where required. Free text responses were collated and given to the audit co-ordinator in each unit.

<table>
<thead>
<tr>
<th>Unit Identification Number</th>
<th>% Would recommend</th>
<th>% Would not recommend</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>96</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>28</td>
<td>100</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2 Friends and Family Test Results

**Observations**

It is not possible to draw any firm comparisons to previous rounds of the audit on a regional basis given the changes to the questionnaire and different units that participated. Individual units who had participated in previous rounds were encouraged to reflect upon any changes noted. An example action plan for Unit 2 was as follows: The receptionist is to arrange the next appointment whilst the patient is present rather than posting appointments out, to allow a choice of appointment times. The unit will also conduct an audit to assess the recording of provision of written information. This was an area that scored poorly but the unit felt this did not reflect current practice. The mean positive responses did not differ significantly for hospital and specialist practitioner providers (96.6 and 96.8 respectively). The average result for the 3 general practices that participated are not reported due to the small number of questionnaires returned. The NHS friends and family test was introduced to primary dental care in April 2015. Although included in the audit there is no standard set by NHS England. It is recommended that the score is presented as the percentage of patients that would recommend the service and the percentage that would not, alongside the number of respondents. The average score for general dental practices in September 2015 was 97% would recommend and 1% would not. In general the regional results for orthodontic providers exceed these values with an average of 97.5% patients that would recommend the services and 0.7% that would not. In previous rounds of the audit a net promoter score (NPS) had been used as the method of reporting the friends and family test results. The NPS is calculated by deducting the number of negative respondents from those who were extremely likely to recommend the service. The NPS in this round of the audit is 76.8 compared to 75 in the previous round which would suggest a slight improvement in care provision. Question 13 asked “who normally provides your care?”; although no standard was set for this question it was clear from responses that patients were not always aware of the role of the clinician providing their care. The response to this question will be useful to individual units in considering how staff introduce themselves to patients.

**Recommendations**

1) The results of the audit have been presented regionally and individual units have been given a breakdown of their results to formulate their own action plan and decide the best interval for re-audit.

**Acknowledgements**

Thanks to all the practices and departments who participated and to Lan Garside Audit Facilitator at The Cumberland Infirmary.

**Project involvement**

Sarah Germain (Project lead, design, data collection, analysis, report and presentation)
Sally Walker (Project design, data collection and report)

**References**

2. Germain S, Stirrups DR. The Northern Region Patient Satisfaction Audit. The European Orthodontic Society Conference poster presentation (2013)
Orthodontics Regional Patient Satisfaction Survey

Please **X** mark your answers and please write clearly inside the box if you wish to leave any comment.

Please write today's date: 

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

This survey is about the orthodontic care you or your son/daughter are receiving. Participation is voluntary and all answers will be treated in confidence. We hope to use the answers to develop and improve our service.

1. Before treatment did a member of staff explain the treatment in a way that you could understand?
   - [ ] Yes, definitely
   - [ ] Yes, to some extent
   - [ ] No
   - [ ] Don't know

2. Do the orthodontic team treat you with respect?
   - [ ] Yes, always
   - [ ] Yes, to some extent
   - [ ] No, never
   - [ ] Not sure/Can't say

3. Are the orthodontic team caring?
   - [ ] Yes, definitely
   - [ ] Yes, to some extent
   - [ ] No
   - [ ] Not sure/Can't say

4. Are you given a choice of appointment times?
   - [ ] Yes
   - [ ] No, but I would like a choice
   - [ ] No, but I do not need a choice
   - [ ] Don't know

5. If you waited more than 15 minutes did someone apologise for the delay?
   - [ ] I waited for less than 15 minutes
   - [ ] Yes
   - [ ] No, but I would have liked an apology
   - [ ] No, but I did not mind

6. In your opinion, how clean is the practice or department?
   - [ ] Very clean
   - [ ] Fairly clean
   - [ ] Not very clean
   - [ ] Not clean at all
   - [ ] Can't say

7. How well organised is the practice or department?
   - [ ] Very well organised
   - [ ] Fairly well organised
   - [ ] Not very well organised
   - [ ] Not at all organised
   - [ ] Can't say

8. Do you find it easy to contact the practice/department?
   - [ ] Yes, always easy
   - [ ] Yes, some of the time
   - [ ] No
   - [ ] I have not needed to contact the department or practice
   - [ ] Can't say

9. How likely are you to recommend our department or practice to your friends or family if they needed similar care or treatment?
   - [ ] Extremely likely
   - [ ] Likely
   - [ ] Neither likely nor unlikely
   - [ ] Unlikely
   - [ ] Extremely unlikely

10. Overall, how would you rate the care you have received?
    - [ ] Excellent
    - [ ] Very good
    - [ ] Good
    - [ ] Fair
    - [ ] Poor
    - [ ] Very poor

---

Please turn over to complete more questions

---

Figure 1
11. Were you given any written or printed information about your treatment?
- Yes
- No, but I would have liked this information
- No, but I did not need this information
- Don't know/Can't remember

12. Do you see the same member of staff whenever you visit the practice or department for your routine appointments?
- Yes
- No
- Can't say

13. Who normally provides your care? (please X mark all that apply)
- Orthodontist
- General dentist
- Orthodontist in training
- Therapist
- Don't know/not sure

Other: please specify -->

14. Is it easy for you to get to / access the department or practice?
- Yes, definitely
- Yes, but it could be improved
- No

Please comment below if you feel this could be improved:

Please write clearly:

If there is anything else you would like to tell us about your experiences in the department or practice, please do so here:

Please write clearly:

Is there anything that could be improved?

Please write clearly:

Any other comments or suggestions?

Please write clearly:

Thank You For Your Time!

For office use only: E.g. 1 2 E.g. A B C 1 2