Moving House!

Although this is the autumn edition of the Clinical Effectiveness Bulletin, I think there has been something of a spring clean within the editorial ranks. This edition has been jointly produced by Kate House, the outgoing editor, and Jadbinder Seehra, our new incoming editor. The team have worked hard to produce an excellent Bulletin with an interesting range of articles. There are some familiar themes again, patient satisfaction and multidisciplinary care, but some more varied projects looking at the periodontal health of our patients and their dietary habits, reflecting the wider scope of our practice.

Knowing that audit is strong within our specialty, I was interested to read that the Healthcare Quality Improvement Partnership (HQIP), the organisation tasked with promoting quality in healthcare, in particular increasing the impact that clinical audit has on healthcare quality in England and Wales, recently promoted its second ‘Audit Awareness Week’. This initiative is aimed at encouraging engagement of staff at all levels in clinical audit within the workplace. Although this is aimed principally at the medical field, it is an idea that we could embrace within our specialty. I think we are ahead of our colleagues in this area and I am pleased to see articles both from practitioners based in primary and secondary care. Within the Society the Audit committee is always thinking of ways to increase audit’s relevance and impact. We would welcome ideas from members of how this could be enhanced.

The BOS Clinical Audit Prizes were announced at the BOC in Edinburgh. The winners were chosen from the last two issues of the CEB and were awarded to:

1st Prize
An audit of compliance in Orthodontics with Department of Health 2007 “Smokefree and Smiling” guidance.
A. McMullin and S. Caldwell (University Dental Hospital Manchester).

2nd Prize
Use of the PAR index to assess outcomes of orthognathic surgery in cleft lip and palate patients.
C. Rolland (VT dentist), C. Chambers (Bristol Dental Hospital) and S. Deacon (Frenchay Hospital and Bristol Dental Hospital).

3rd Prize
Orthodontic treatment and orthognathic surgery – do we predict the length of treatment accurately?
C. Dunbar, G. McIntyre (Dundee Dental Hospital) and S. Laverick (Ninewells Hospital, Dundee).

Many congratulations to all the winning authors. I know it is a difficult task selecting winners with the number of high quality reports that are submitted and published. I would like to thank all the authors for continuing to support this publication and the editorial board and referees for all their hard work in its production.

I’ll finish by wishing Jadbinder every success in his term as Editor and thanking Kate for all her hard work over the past three years. I know that Kate has left the Bulletin in safe hands.

Nikki Atack
Director, Clinical Governance
Editor’s Cut

This is my first editorial as the new Editor of the BOS Clinical Effectiveness Bulletin. I would like to begin by thanking my predecessor, Kate House, for her tremendous hard work and effort. I am sure we would all agree under Kate’s stewardship the Bulletin has gone from strength to strength resulting in a high quality publication reflecting the excellent clinical standards practised by orthodontic clinicians within the United Kingdom. On a personal note, I would also like to thank Kate for showing me the ropes and ensuring a smooth handover and transition.

I would also like to thank both Gavin Mack (South-East) and Amreen Ahmad (Northern) for their hard work and contribution to the success of the Bulletin. Both Gavin and Amreen, who will be leaving their positions on the editorial board, have excelled within their roles as regional sub-editors. New sub-editors for these regions will be appointed in due course. I look forward to working with the existing and new editorial board members who I am sure will further enhance the reputation of the Bulletin.

The success of the Bulletin is also dependent on the numerous Post-CCST trainees across the country who undertake peer-review of articles. I have found these reviews to be conducted in a careful and diligent manner and I would like to thank you all for your continued support and excellent reviews!! This is greatly appreciated. Lastly, the Bulletin would not be in circulation without the numerous high quality articles submitted for publication by members of our Society.

The effort made by clinicians to report standards of clinical practice and improve clinical effectiveness is impressive. I would strongly encourage all members of the orthodontic team in both primary and secondary care to consider submitting their articles to the Bulletin.

What does the future hold for the Bulletin? First and foremost I hope very much to continue the success of this publication and continue the great work of my predecessors. I am aware of the responsibility that comes with this role and I hope that I do not disappoint. I will be exploring options to further improve the submission process, overall format and content of the Bulletin. If any member of the Society has any thoughts and ideas, please feel free to contact me.

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5. An audit to assess the number of inappropriate referrals to a primary care specialist orthodontic practice. P. Raval. Peace Children’s Centre, Watford


7. Orthognathic surgery precision - A retrospective audit of planned and actual movements during maxillary surgery. H. Barry, P. Shah, H. Popat and A. Cronin. University Dental Hospital, Cardiff & Vale University Health Board and School of Dentistry, Cardiff University


9. A regional audit to assess the surgical re-exposure rates of ectopic palatal maxillary canines. A. Gill, R. Vajifi Bharma, T. McSweeney, M. Palarajah; B. Bagdadli; C. Campbell; John Radcliffe Hospital, Oxford, Heatherwood and Wexham Hospital, Slough and Stoke Mandeville Hospital, Buckinghamshire


11. An audit on patient experience following orthognathic surgery. M.W. Tang and A. Dilbiase. William Harvey Hospital, Ashford, Kent

12. A regional audit of orthognathic service provision and treatment duration. A. Tsichlaki, S. Ward. University Dental Hospital Manchester, Royal Blackburn Hospital


INTRODUCTION

Functional appliances are frequently used in the United Kingdom for treatment of Class II malocclusions\(^1\). A successful outcome is strongly dependent on patient compliance, appropriate case selection and subsequent timing of treatment\(^2\). If a positive treatment outcome is achieved there can be a fundamental effect on a patient's self perception and confidence\(^3\).

The purpose of this audit was to investigate the outcome of treatment using functional appliances at the Royal Berkshire Hospital Orthodontic Department. Previous audits completed at Worcester Hospital, St George's Hospital and Glasgow Dental Hospital have shown successful treatment outcome with functional appliances ranging from 58% to 77%\(^4\)\(^5\)\(^6\).

Within the hospital department two types of functional appliances are used, twin block and medium opening activator appliances. Clinicians vary between a preference for one advancement or incremental advancement of the functional appliance. For maximum advancement the functional bite is taken at an edge-to-edge incisor relationship. For incremental advancement a functional bite is taken with 6mm advancement and a further appliance made once the first has been successful. A randomised controlled study by Banks et al. 2004 has found there is no advantage of 2mm advancements with an advancement screw compared to a single advancement\(^7\). The aim of this audit was to assess the success of treatment with twin block and medium opening activator appliances and with different methods of activation.

AIMS

The aims of this audit were:
1. To assess the success of functional appliance treatment and length of active treatment with:
   a. Different types of functional appliances used within the department.
   b. Incremental compared to a single advancement of the functional appliance.
2. To evaluate the length of treatment in non-compliant patients.

GOLD STANDARDS

1. Treatment success - 100% of functional appliance treatment should reduce the overjet to a Class I incisor relationship (2-4mm). This standard was chosen as it had been used in previous audits at Worcester and Glasgow Hospitals\(^4\)\(^6\).

2. Non-compliance - At least a 10% reduction in the overjet should be seen within six months. If the overjet has not reduced by 10% in 6 months the patient will be classed as non-compliant for the purpose of this audit. This was the standard used in the O'Brien et al. 2003 study when assessing the effectiveness of early treatment\(^2\).

3. Record keeping - All patients should have the following occlusal parameters recorded pre- and post-treatment:
   - Overjet
   - Overjet or reverse overjet at maximum protrusion
   - Molar relationship
   - Canine relationship
   - Overbite
   - Centreline

METHODS

This was a retrospective audit completed at one district general hospital. One hundred consecutive patients treated with a functional appliance were identified from the laboratory database. Patients were treated over a four-year time period from January 2007 to January 2011. Data was collected from the hospital notes and entered onto a proforma. The following data was collected:
1. Type of functional appliance.
2. Incremental or single advancement.
3. Age of patient at the start of treatment.
4. Gender.
5. Overjet at the start of treatment.

RESULTS

There were 100 patients included in this audit with a mean age of 12 years 6 months. Of these 61 were male and 39 female. The mean start overjet was 10.8mm.

Treatment success

The overall success of treatment with the overjet reduced to a Class I incisor relationship was 71% of patients in an average treatment period of 11.8 months. In those patients whose treatment was not successful, according to the audit standard, the average treatment period was 13.5 months.

Table 1 shows the reasons for the 29% whose treatment was not successful.

<table>
<thead>
<tr>
<th>Reason for unsuccessful treatment</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor compliance</td>
<td>14</td>
</tr>
<tr>
<td>Did not respond to treatment</td>
<td>6</td>
</tr>
<tr>
<td>Did not return to department</td>
<td>5</td>
</tr>
<tr>
<td>Breakages</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 1 – Reasons for unsuccessful treatment
The twin block appliance was more successful than the medium opening activator with 74% and 53% success respectively.

<table>
<thead>
<tr>
<th>Appliance type</th>
<th>% of cases</th>
<th>Success (Class I incisor relationship) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twin block</td>
<td>81</td>
<td>74</td>
</tr>
<tr>
<td>Medium opening activator</td>
<td>19</td>
<td>53</td>
</tr>
</tbody>
</table>

Table 2 – Treatment success to a Class I Incisor relationship according to appliance type.

Incremental advancement was found to be more successful than a single advancement but had a longer treatment time.

<table>
<thead>
<tr>
<th>Advancement type</th>
<th>% of cases</th>
<th>Success (%)</th>
<th>Length of treatment (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>47</td>
<td>57</td>
<td>9.2</td>
</tr>
<tr>
<td>Incremental</td>
<td>53</td>
<td>87</td>
<td>14.1</td>
</tr>
</tbody>
</table>

Table 3 – Treatment success to a Class I incisor relationship according to the advancement type.

Non-compliance

Nineteen percent of the patients were classed as non-compliant, less than a 10% overjet reduction after 6 months. Ten percent were therefore classed as compliant but did not achieve complete overjet reduction and did therefore not meet the audit standard. In these non-compliant patients treatment was attempted for an average of 12.8 months.

Most patients, 81%, were treated with a twin block appliance and 19% with a medium opening activator. The twin block was the more successful appliance with 74% reducing the overjet to Class I compared to 53% in the medium opening activator. Consideration is now being given to using more twin block functional appliances in the department rather than medium opening activators.

There was approximately half of the patient group that had incremental and a single advancement. Incremental advancement was more successful than a single advancement, 87% and 57% respectively. However treatment length was longer, 14.1 compared to 9.2 months. Although treatment length is increased the improved success is significant. Longer treatment may also improve long-term stability as found in a recent study.

Within the department it has been decided to use twin block appliances with incremental advancement due to the results of this audit.

Other than the overjet the other occlusal parameters were poorly recorded in the notes at the start and end of functional appliance treatment. This should be improved to enable monitoring of treatment progress, treatment planning and future audit collection. A proforma is to be introduced to be completed at the start and end of treatment.

CONCLUSIONS

The gold standard set for this audit and their respective outcomes were as follows:
1. 100% of functional appliance treatment should reduce the overjet to a Class I incisor relationship. This standard was not achieved as the overall success of functional appliance treatment was 71%. Success rate increased for the twin block appliance that was advanced incrementally.
2. At least a 10% reduction of the OJ should be seen within six months. 19% of patients were classed as non-compliant.
3. All patients should have occlusal parameters recorded pre- and post-treatment. These parameters were often not recorded.

PLAN
1. To increase the use of twin block appliances that are activated incrementally.
2. Continue motivating patients to wear their appliance.
3. If there has been little change in the overjet after 6 months treatment reassess and consider changing the treatment plan.
5. Re-audit in 3 years.

REFERENCES

NEW PATIENT SATISFACTION
S. Nandhra Orthodontic Senior Specialist Registrar, S. Power, E. Thickett Consultant Orthodontist, Royal Bournemouth Hospital

INTRODUCTION
In recent years a shift has taken place in the medical disciplines from a focus on scoring procedures from a technical standpoint to one of a patient focused outcome1 (Patient reporting outcome measures (PROMS)). This has been further supported by the findings of the Francis report2.

Within orthodontic circles most PROMs have focused on patients’ satisfaction with treatment3,4, with recent audits on patient satisfaction with orthodontic care being approximately 90%-5, 6. However, a large proportion of the patients seen in the new patient clinics will not be suitable for treatment within the hospital services. Therefore, their patient experience has not been rated to date.

We should also consider that the first interaction a patient may have with a hospital department is at one of our new patient clinics. This encounter may determine the patients’ future view of hospital departments.

Many of our patients have chosen to come to see us through the Choose and Book system. All referrals are sent to the Patient Contact Centre (PCC) and then the patient can choose where they wish to be assessed regardless of their IOTN or their GDPs preference. The only information being given to them is information from their GDP and a letter from the PCC stating which providers they may choose from. If the patient chooses to come to the department a leaflet is sent to them about the department with their appointment.

Due to the strict acceptance criteria for treatment in the hospital orthodontic department a large percentage of the patients seen are not eligible for treatment in the hospital setting. Within a recent departmental audit of all referrals only 26.5% of patients were placed onto the department waiting list for treatment.

Once seen they may be referred to other providers in the primary care setting. A small number of these patients have in the past expressed annoyance at having what they perceive to be a ‘wasted’ visit. It was decided therefore to carry out an audit of patient opinion of their experience at our new patient clinics.

AIMS
The aims of this audit were to ascertain:
• If patients were being given appropriate information before their appointment.
• Whether patients were satisfied with their experience in the orthodontic department when attending the new patient clinic.

STANDARDS
• 90% of patients should receive appropriate information prior to their appointment.
• 95% patient satisfaction (would recommend the department to friends and family).

The standard for patient satisfaction was set after discussion at the departmental governance meeting. Although other audits have set a standard on 90%5,6.

METHOD
This was a prospective audit commencing February 2013 for a period of three months. Data was collected on 250 consecutive new patients attending the Orthodontic department of the Royal Bournemouth Hospital (RBH). A two part questionnaire was devised with input from all members of the orthodontic department; this was then ratified by the patient information group (PIG) prior to use.

The first part of the questionnaire was completed as the patient entered the department and prior to being seen by the
orthodontist. This related to the information that the patient received prior to coming for their appointment and why they chose to come to the RBH orthodontic department. On completion of their consultation the second part of the questionnaire focusing on patient satisfaction with their overall experience was completed. Results were analysed using Microsoft Excel 2007.

RESULTS

Two hundred and fifty patients were asked to participate in the audit (4 forms were unreturned), therefore 246 patients were included in the audit. The majority of patients seen were between the ages of 12 and 16 (55.9%), 34.7% of patients were under the age of 12, and only 9.4% of patients were over 16 years old.

Figure 1 shows the response to “What information did you receive before booking this appointment?” Eight patients did not respond, 30 patients received more than 1 piece of information and 21 patients stated they were given no information. Therefore 29 patients (12%) received no information prior to their appointment. Forty five patients selected “other”, of these 13 patients received information from the dentist. Other responses included information from siblings and the referral letter.

Question 2 “Why did you choose to be seen at the department Hospital? Please rank”.

There were 687 responses to this question. When ranking is excluded from the calculation location achieved the highest percentage (24%), with all other categories receiving a similar response except for “not sure why booked” which was 1%. Figure 2 shows when ranking is included, location ranks the highest with other categories receiving a similar ranking. The most common response within the “other” category was the dentist had referred them and they had no choice (25 patients), or the dentist recommended the hospital (4 patients). Patients also reported the RBH Orthodontic department was chosen due to previous positive experiences with family or friends (12 patients).

Question 3 “Did you know that only the more severe cases get treatment in the hospital?” Figure 3 graphically displays the results and shows that only 27% of patients knew that only severe cases get treated in hospital. Of the 12 patients who had reported previous positive experience with the Orthodontic department (Question 2) 7 knew only the more severe cases got treatment in the hospital.

Question 4 “Was the appointment made at a convenient time for you?”

89.8% had the appointment made at a convenient time with 10.2% responding no.

Question 5 “Did you find the orthodontist friendly and approachable?”

99.2% responded yes with only 2 patients (0.8%) responding no.

Question 6 “Did the orthodontist explain what they were doing?” 100% of patients responded yes.

Question 7 “Were you seen within 30 minutes of your appointment time?” 16 of 244 (6.7%) patients were seen after 30 minutes of their scheduled appointment time.

Question 8 follows on from question 7 “If not, were you kept informed of the delay?” Only 3 of the 16 (19%) of the patients who were delayed were kept informed. With 7 of 16 reporting they were kept informed of the delay and 6 of 16 not responding.

Question 9 “Do you have any suggestions for improvement of the facilities/waiting area?”. 22 patients responded, 13 suggested no improvement, and 2 suggested toilets within the department. The other 7 responses were only suggested once e.g. childrens play area, brighter walls.

Question 10 “Are you generally happy with your visit to the department?” Only 2.5% responded no.

Question 11 “How likely are you to recommend our Orthodontic department to friends and family if they needed similar care or treatment?”

Figure 4 shows a graphical representation of the responses. All 244 patients responded, only 2.1% of those who responded would not recommend the Orthodontic department. 89% of those who responded were likely or extremely likely to recommend the department.
Figure 4

Question 12 followed on from question 11 and was “Please can you tell us the main reason for your choice?” 124 responses were received. Of these responses the only negative comment was “Due to me having to wait ages”. All the other comments were positive with the staff and the department being complemented.

The final question “Do you have any suggestions for improving your visit?” 15 patients responded, with 5 suggesting nothing was required; other comments were varied and included;

- 2 suggested that GDPs should provide more information on where to pick when referred to save a “wasted visit”.
- 1 patient wrote “Unfair process of analysing of teeth” - same patient who was extremely unlikely to recommend the department to friends/family.

DISCUSSION

The patient satisfaction results from this audit are positive with only 2.1% of patients being unlikely to recommend the department. However, only 89% of patients were likely to recommend the department, which is below the audit standard of 95%. Positive comments were received about all the staff and the services within the department, with the few negative comments relating to the orthodontic departments acceptance criteria. If it is considered that within the context of a previous departmental new patient audit in 2013, that only 26.5% of patients are placed onto the waiting list and 50% are discharged from the department, it is encouraging that patient satisfaction is so high. The areas that could help possibly improve patient satisfaction would be to:

- Minimise delays in seeing patients
- Keep patients informed if there are any delays
- Improve communication with GDPs (i.e. advise patients when choosing and booking whether it would be more appropriate for the patient to be seen in specialist practice or hospital)

The results for information received prior to attending the department is less positive with 12% receiving no information prior to attendance which falls short of the 90% standard set. Also only 27% of patients knew that only the more severe cases are eligible for treatment in hospital. Many referral letters from GDPs state that they wish for the patient to be seen in specialist practice, but the Choose and Book system overrides this and therefore they are still being seen in the hospital. There have been several conversations within our locality to attempt to resolve this; however the Choose and Book system is to remain in its current guise. Therefore, a possible way of improving the situation for patients and from a resource standpoint is to liaise with GDPs and ask them to inform patients on referral where they deem may be the appropriate place for the patient to be seen.

Also the current information sent out to the patient by the hospital prior to the appointment only gives general advice about how to travel to the department and what to expect at the appointment. This is potentially a missed opportunity and it would be advantageous to reinforce the strict acceptance criteria of the hospital so that the patient has more information on the possibility of treatment at department.

ACTION PLAN

- Disseminate results at Orthodontic departmental staff meeting.
- Staff to keep patients informed if there are any delays over 15 minutes.
- Arrange for an IOTN and referral day for referring GDPs to reiterate the hospitals acceptance criteria and how to best inform patients when choosing and booking.
- Re-design patient information leaflet posted out to patients before visiting the department (hospital only treating the more complex malocclusions).
- Re-audit February 2015

CONCLUSIONS

- The orthodontic department is performing well with 89% of those who responded likely or extremely likely to recommend the department.
- Unfortunately of the 16 patients who were kept waiting only 3 were kept informed of the delay.
- Improved communication is required with GDPs so that patients may be able to more appropriately Choose and Book.

REFERENCES

3 PATIENT SATISFACTION WITH CROYDON MDT DENTO-ALVEOLAR CLINICS

L. Khamshta-Ledezma (Senior Specialist Registrar), Z. Kordi (Senior Specialist Registrar), J. Radecki (Associate Specialist), L. Davenport-Jones (Consultant Orthodontist), M. Chia (Consultant Orthodontist), Croydon University Hospital.

INTRODUCTION
There is a move towards a modern patient-centred healthcare system where patient empowerment in the management of their care, treatment and planning of services is key\(^1\). Putting Patients First, introduced a new system using an 11-point NHS England Scorecard, reflecting the eleven core priorities against which the performance will be measured, the first principle being “satisfied patients”\(^2\). The document states direct feedback from patients and their families and feedback from our staff will be the most important measures\(^2\). Satisfaction surveys provide patient feedback, allowing their views to be taken into account when planning service quality improvements. These have become common place within NHS Trusts and are part of the Key Performance Indicators (KPIs) linked to payment in primary dental care services already. On average, previous audits found patient satisfaction with orthodontic treatment to be in the region of 88%-97%\(^3,4\) and with a Joint Multidisciplinary Hypodontia Clinic experience of 99\%\(^5\).

At Croydon University Hospital, multi-disciplinary clinics between Orthodontics and Oral Surgery are held for patients who require combined management. It was felt by the clinical team these provide a good service which is not commonly available in every hospital. The number of referrals to the clinic was noted to have increased in recent times. Hence, the patient’s satisfaction and suggestions were thought to be essential when identifying ways in which to improve and develop our services. In this case, running multi-disciplinary clinics incurs higher costs, is potentially more time-consuming for administrative staff and requires staff to be present from a number of specialties. Therefore, the justification for their existence and the quality of care provided by these becomes essential when considering increasing the number offered by a Trust.

AIMS
The aim of this audit was to assess patient/parent satisfaction with Multi-disciplinary (MDT) Dento-Alveolar Clinics with regards to the following aspects;
1. Reception: satisfaction with reception staff, registration process, information provided in advance (e.g. date, time, directions) and waiting times.
2. Facilities: satisfaction with consultation room cleanliness, radiographic department arrangements and waiting room and toilet facilities.
3. Staff: satisfaction with the team’s helpfulness, friendliness and communication between members of the team and the patients. Information and explanations given about the different treatment options and risks and advantages of all.
4. Overall experience of attending the MDT Clinic: If they felt it was worth attending, provided them with sufficient information and would recommend it to others having a similar procedure.
5. To identify areas for improvement for appropriate actions to be implemented to improve our services in all of above aspects.

METHOD
A prospective questionnaire based survey was undertaken over 5 months, between December 2012 and May 2013 at Croydon University Hospital. Anonymous questionnaires were distributed to all consecutive patients during the audit period following their Dento-Alveolar Clinic appointment. They were completed by patients if older than 16 years of age or their parents/legal guardians if younger. These were then handed to reception staff who collated them. The questionnaire consisted of 28 questions with a 4 point grading scale; 1 being strongly disagree, 2 disagree, 3 agree and 4 strongly agree. The aspects covered included satisfaction with reception, facilities, staff and overall experience. A free text “comments box” was included at the end.

Pilot:
In developing the questionnaire a pilot run was undertaken to test the language clarity/readability and trial how the distribution and collection of these would work most efficiently within our department. The questionnaire was distributed to 9 patients who attended a clinic and their responses and comments reviewed with the Orthodontic and Oral Surgeon Consultants. The wording of some questions was revised to improve the conciseness and reduce ambiguity.

STANDARD
Following review of previous comparable audits\(^6,8\), the patient satisfaction standard was set as 90% satisfaction (scores of 3 or 4) in all aspects of the questionnaire.

RESULTS
Data for 61 patients were collected and analysed. The questionnaires were completed by patients (65%) and parents (35%). The most common reason for referral was impacted canines (46%). BOS information leaflets were given to 34% of patients. All patients stated that they understood the treatment options, benefits and risks, their questions were fully answered and they were satisfied with the agreed plan. Twenty three of the 28 questions asked were scored by over 90% of patients as 3 or 4, with 10 questions being scored as such 100% of the time.

Experience in MDT Clinic Section
All patients were satisfied (scores of 3 or 4) with the experience of attending the MDT clinic, felt they were given enough information to understand the risks and benefits of the different options and were given an opportunity to ask questions (Table 1). Of the 98% of patients who would recommend the clinic to someone requiring a similar type of treatment, 43% agreed and 55% strongly agreed with this statement.

![Graph](image-url)

Table 1. Patient satisfaction with the experience in the MDT Clinic.

<table>
<thead>
<tr>
<th>Score 4</th>
<th>Score 3</th>
<th>Score 2</th>
<th>Score 1</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>Clinical area was organised and clean</td>
<td>Given opportunity to ask questions</td>
<td>Given enough information and had understood the options</td>
<td>Given enough information and had understood the risks and benefits of the different options</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(^1\) Putting Patients First,\(^2\) Satisfaction surveys,\(^3\) Reference 3,\(^4\) Reference 4,\(^5\) Reference 5,\(^6\) Reference 6,\(^8\) Reference 8.
MDT Clinic Team Section
All patients were very satisfied with the staff they came across in their MDT appointment. Ninety seven percent felt each member of the team introduced themselves or were introduced making it clear who everyone was and found everyone was helpful and friendly (98%). All patients were satisfied with the communication between members of the team and with themselves (Table 2). Of the 9 questionnaires where comments were written in the “comments box”, 7 were with positive remarks and most of these related to the friendly, helpful staff and excellent service. For instance, “friendly informed staff, allowed my daughter to be relaxed”, “excellent service! Very well explained”.

Table 2. Patient satisfaction with the MDT clinic staff.

Reception and Waiting Room Section
Patients were satisfied with the information given in advance, the welcome received and registration process (Table 3a). However, the five questions which did not achieve the gold standard (set at 90% satisfaction) was not achieved were related to the facilities (toilets and décor of the waiting area) and delays with clinics. In the majority of cases any radiographs required tend to be requested in advance of the joint clinic. However, on occasions these are taken on the same day which would cause a delay for patients.

Table 3a. Aspects with which patients were satisfied with regarding reception and facilities.

The questions which fell short of the gold standard (set at 90% satisfaction) related to the facilities - toilets (88%) and waiting room décor (82%) and the waiting time to be seen in the clinic (83%) and radiography departments (83%). Although for these questions 90% of patients did not score a 3 or 4, most were between 82-88%, indicating a mild degree of dissatisfaction with the facilities. One of the most likely reasons for the delay to be seen in the MDT Clinics would have been the overbooking of these clinics, due to the increased demand. In the majority of cases any radiographs required tend to be requested in advance of the joint clinic. However, on occasions these are taken on the same day which would cause a delay for patients.

This was a simple questionnaire to retrieve feedback on patients’ satisfaction to help in planning improvements to our services. A pilot trial was undertaken to ensure the language used was appropriate, the design was easy for patients to complete and the information gathered was appropriate and relevant. However, the method could have been improved by the use of a validated patient satisfaction questionnaire.

The gold standard was set as 90% satisfaction in keeping with previous audits. Satisfaction and how this is measured is a complex subject as there are multiple factors which would influence it such as expectations, values and previous experiences. The latter factors are difficult to identify, quantify and account for and in the scope of this audit this was not attempted. Taking into account the scope of this audit, the results are comparable to those of an audit undertaken to assess patient satisfaction with Joint Hypodontia Clinics, as almost all patients felt attending had been worthwhile in both their use of a validated patient satisfaction questionnaire.

CONCLUSIONS
Overall the patients were very satisfied with the service provided and the team involved in its provision, with 98% of patients recommending this service to others who may require a similar treatment. The only questions for which the gold standard (90% satisfaction) was not achieved were related to the facilities (toilets and decor of waiting area) and delays with clinics.
ACTION POINTS
Following discussion of the results the following action plan was agreed:
1. Increasing the number of MDT clinics to help reduce waiting times to be seen in this clinic and avoid overbooking clinics and hence help avoid delays in seeing patients when they attend these clinics
2. Improvements to décor of the waiting room
3. Training of all reception staff
4. Re-audit in 6 months

ACKNOWLEDGEMENTS
We would like to thank all the nursing and reception staff for their help in distribution and collection of the questionnaires and to the patients who kindly took their time to complete these.

INTRODUCTION
The retention phase of orthodontic treatment is crucial in ensuring long term stability of treatment and preventing relapse. The aetiology of relapse is multifactorial; contributing factors include periodontal and occlusal factors, soft tissue pressures and unfavourable growth patterns.

A wide variety of retention regimes and methods, including both fixed and removable options, are utilised by clinicians. Although there is little agreement among orthodontists as to the most appropriate regime all orthodontists agree that retention is a fundamental component of the treatment plan. It is essential that both patients and parents understand from the outset the implications and requirements of retention. Therefore, the commitment required in terms of retention should form part of the informed consent process. A Cochrane review of orthodontic retention concluded that there is insufficient evidence regarding the different types of retainers and retention regimes1.

AIMS
• To assess the understanding of the need for retainers of patients currently undergoing fixed orthodontic treatment.
• To evaluate patients knowledge of the retention phase of treatment.

GOLD STANDARD
There are no previously defined standards in this area however, after peer consensus it was agreed that 90% of patients should be aware of the need to wear retainers following completion of active orthodontic treatment.

MATERIALS AND METHODS
This was a prospective multicentre audit carried out in the West Midlands region with five participating units: Birmingham Dental Hospital, Worcester Royal Hospital, Burton Upon-Trent Hospital, Good Hope Hospital and the University Hospital of North Staffordshire. A pilot questionnaire was distributed to twenty patients to assess for readability and understanding.

REFERENCES
Although 65% of patients stated that they understood the function of retainers, only 54% of patients were able to give a reason for the need for retainer wear and even then the responses given were often incorrect.

Overall 30% of patients felt that if relapse occurred they would be entitled to orthodontic re-treatment. The responses to this question were similar among the participating units; with the exception of the Birmingham Dental Hospital where over 80% of patients thought that they would be entitled to a second course of treatment. 46% of respondents were aware that if relapse occurs due to lack of retainer wear further treatment is not covered by the NHS.

85% of participants reported that the retention phase was well explained to them and 63% of patients were able to recall receiving a written information leaflet on retainers (Figure 2).

![Figure 2: Patients able to recall receiving a written leaflet](image)

**DISCUSSION**

Retainers are an important part of orthodontic treatment and it is pertinent that patients are fully consented for wearing retainers prior to commencing treatment. Although the majority of patients are aware of the need to wear retainers, given the large number of patients that are undergoing treatment in the five participating units having 18% unaware of the need to wear retainers is still a significant number. The need for retainers is explicitly stated on the consent form so the reason for this finding may be that the patients cannot remember being told about retainers at the beginning of treatment.

Only 63% of patients were given a written leaflet, however on analysis of the data there was little difference of patients understanding of retention between the patients that were given the leaflet and patients that were not. Previous studies have however demonstrated that verbal information should be supplemented by written and/or visual information and it may be that the sample size in the present audit was too small to detect a difference. 65% of patients said that they knew why retainers were required but when asked to fill in a box explaining the reasons, a large number of patients left the section blank and of those that did complete it, a significant proportion put the wrong answer. Some of the incorrect answers included:

- Because they will push my teeth into place
- Move my jaw in line
- To pull the baby tooth out and push the older tooth down
- To maintain the shape of the teeth
- To open my jaw wider
- Hopefully will not need them
- Bring my teeth down to correct my bite
- To create gaps and reposition my bite

A third of patients think they can have a second course of treatment to address relapse but nearly 50% of patients are aware that this is not covered by the NHS.

85% of patients think that wearing retainers was well explained to them however, given that not all patients know they will need to wear retainers, or are aware of the function of retainers and their duration of wear and nearly half of patients incorrectly assume they can be re-treated in the event of relapse this figure might be optimistic. It’s probable that there is some responder and questionnaire bias with some patients keen to give us what they think is the correct answer.

There was consistency among the 5 units involved in the audit, with the exception being the question ‘If you do not wear your retainers and your teeth move do you think you will be allowed to get your braces put on’. Over 80% of patients in the Birmingham Dental Hospital thought they could have re-treatment in the event of non-compliance with retention and subsequent relapse. However, when fitting retainers at the Dental Hospital patients are asked to sign a retainer consent form which reiterates to patients the importance of wearing retainers and allows clinicians to tailor make a retention regime for that patient. It also clearly stipulates that patients will not be re-treated in the event of relapse. Therefore all patients in retention should be aware of the implications of failing to comply with the retention phase of treatment.

**RECOMMENDATIONS**

- Reinforce to clinicians the importance of fully consenting patients for retainer wear. Remind patients throughout treatment that they will be required to wear retainers when their active treatment is complete.
- Provide written leaflets at the beginning of treatment.
- Clinicians to advise patients that they will not be entitled to further treatment in the event of relapse if the retention regime is not adhered to.
- Place posters with written information on retainers in the waiting rooms of the participating units. Recently at the Birmingham Dental Hospital a television screen has been set up in the waiting room which explains to patients various aspects of orthodontic treatment including retainers.
- Unfortunately it is difficult to improve patients’ retention of information and giving patients information in as many ways as possible should help to keep them informed of their treatment.

**RE-AUDIT**

A second cycle is planned in 12 months.

**CONCLUSIONS**

Although the majority of patients are aware of the need to wear retainers following active orthodontic treatment, not all patients understand the purpose and duration of retention and the consequences of relapse. The need for retainers should be explained as part of the consent process and reinforced throughout treatment, in particular at debond.

**REFERENCES**


AN AUDIT TO ASSESS THE NUMBER OF INAPPROPRIATE REFERRALS TO A PRIMARY CARE SPECIALIST ORTHODONTIC PRACTICE

Pritesh Raval Dental Officer, Peace Children’s Centre Watford

INTRODUCTION
NHS orthodontic waiting list times are increasing in line with the demand for NHS orthodontic treatment, as there is increasing patient education and awareness of the orthodontic treatments available. The average waiting list time for an initial consultation at the practice at which this audit took place was four months. A major factor for this waiting time is the number of inappropriate referrals sent to these specialist practitioners resulting in wastage of time, materials and NHS resources as well as delaying treatment for other patients. General dental practitioners are also becoming frustrated with the length of time their patients are kept waiting. With the new contract changes which were implemented in April 2014, orthodontists are now, more than ever, looking to reduce inappropriate referrals.

The multiple NHS primary care orthodontic practitioners in this region are happy to see and treat patients who present with malocclusions that require routine orthodontic treatment to correct malocclusions that fulfil the IOTN criteria for NHS treatments (IOTN of 3.6 and above). In addition to this, O’Brien’s paper of 1996 highlighted that for successful orthodontic treatment patients need to be the correct age for orthodontic treatment, have excellent oral hygiene, are aware of what is required of them and are keen for treatment. In another audit undertaken at Bradford Teaching Hospital, the number of inappropriate orthodontic referrals was found to be 35% and in comparable audits conducted at Ipswich Hospital and the Royal London Hospital, the percentage of inappropriate referrals was around 61%.

AIMS
The aims of this audit were to:
• assess the number of inappropriate referrals sent by referring general dental practitioners to an NHS primary care specialist orthodontist
• to assess why such referrals were inappropriate

CRITERIA AND STANDARD
Our standard was that 100% of the referrals should be appropriate and fulfil all criteria for NHS orthodontic treatment. This is readily available from the British Orthodontic Society’s guidelines for referrals document. These standards include:
• IOTN of 3.6 or above
• Excellent oral hygiene
• Appropriate age for orthodontic treatment
• Patients knew what was expected of them and were willing to comply and cooperate

METHOD
All new referrals to the specialist orthodontic practice were recorded for a four month period from July 2013 to October 2013 inclusive. All the inappropriate referrals were recorded and the reasons for this noted.

The referrals were only deemed inappropriate once an examination had been conducted unless it was based on age. The same orthodontist reviewed all new patient referrals. The referrals were deemed inappropriate on the following grounds:
• Patient too young
• The patient did not meet the NHS criteria of being an IOTN of 3.6 or above
• Poor oral hygiene or caries present
• Patient was not willing to comply with treatment

Questionnaire – Retainers
In order to continuously improve our services and patient experience at the Birmingham Dental Hospital we regularly undertake clinical audits. I would be grateful if you could take a couple of minutes to complete the questionnaire below.

1. Were you told at the beginning of treatment that you will need to wear retainers when your brace is removed? Yes No
2. Do you think wearing retainers was explained well to you when you signed the consent form? Yes No
3. Were you told how many hours a day you will need to wear your retainers to begin with? Yes No
4. Were you told how long in total you need to wear your retainers for? Yes No
5. Do you know what retainers look like? Yes No
6. Do you know why you need to wear retainers? If so why? Yes No
7. If you do not wear your retainers and your teeth move, do you think you will be allowed to get your braces put back on to straighten your teeth? Yes No
8. Are you aware that there will be a charge for having your braces again? Yes No
9. Were you given a written leaflet about retainers when you started your orthodontic treatment? Yes No

Thank You

Appendix 1
RESULTS
The data revealed that over this four month period, 109 new patients were referred to this specialist practice. Of these 109 patients, 21 were refused treatment as the referral was deemed inappropriate. This equates to almost 1 in every 5 referrals being inappropriate.

Figure 1 – Percentage of inappropriate referrals

The reason for the inappropriate referrals was noted and is shown in table 1 below.

<table>
<thead>
<tr>
<th>Inappropriate referral reason</th>
<th>Number of patients</th>
<th>As a percentage of the total number of inappropriate referrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOTN too low</td>
<td>16</td>
<td>76%</td>
</tr>
<tr>
<td>Poor oral hygiene</td>
<td>4</td>
<td>19%</td>
</tr>
<tr>
<td>Patient not fully aware of the treatment or not willing to comply</td>
<td>1</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 1 – Reasons for inappropriate referral

DISCUSSION
As is evident from the results of this audit, 19% of referrals can be considered to be inappropriate. The standards as set out at the beginning of this audit are therefore not being met. As a result, this leads to longer waiting times, delays in starting treatment for eligible patients and a wastage of NHS resources.

Table 1 demonstrates that of the inappropriate referrals, 76% of them were due to the IOTN being too low, 19% due to poor oral hygiene and 5% due to patient not being fully aware of the treatment or not willing to comply. These factors can be addressed and controlled by the general dental practitioner prior to referring the patient and if necessary, not referring the patient or providing alternative options. This alone would save a significant amount of time, reduce waiting list times and direct NHS resources more efficiently.

It has become apparent amongst orthodontists working in the primary care setting that referrals must be appropriate and conducted in a controlled manner. This has become increasingly important due to the changes implemented in April 2014 to contracts, which will no longer compensate for examinations in respect of inappropriate referrals. This will in turn impact on key performance indicators.

General dental practitioners are best suited to assess a patient’s willingness to under-go orthodontic treatment and their compliance as well as their overall oral hygiene levels. This is because they have more regular contact with the patient and are therefore in a better position to judge their appropriateness for orthodontic treatment. The general practitioner may have a multitude of reasons as to why they are referring patients with a low IOTN. The reasons could be that they are unsure as to what IOTN the patient categorises under or that they are borderline and would want clarification from the specialist. They could be referring due to pressure from parents or they may not necessarily want to be the bearer of the bad news. They may also feel that their experience and expertise as general dental practitioners limits them on deciding whether a patient is eligible or not for NHS orthodontic treatment. Education for general dental practitioners in NHS orthodontic referrals is therefore of paramount importance and regular post-graduate education, undertaking mandatory training or core CPD would assist in reducing the level of inappropriate referrals as this would increase awareness and confidence. It may also assist if additional audits were undertaken to further understand the reasons for inappropriate referrals. For example, an audit could be undertake to understand what proportion of the IOTN inappropriate referrals fall into the category of referrals made due to pressure from parents.

As commissioning becomes increasingly regulated, it is prudent that all referrals are appropriate. It is essential that hospital services do not become overwhelmed with practitioners referring their patients directly because of the stricter criteria that primary care orthodontists have implemented, as this shifts the inappropriate referral burden from primary to secondary care and does not solve the problem.

CONCLUSION
From this audit it is evident that there are a large number of inappropriate referrals. This should be addressed in order to improve services, waiting list times and reduce wasted resources. Based on the above findings, the authors make the following recommendations:

- All referring general dental practitioners are made aware of the BOS referral guidelines
- A proforma is used for every referral which must be ticked and sent by the referring practitioner before the patient is seen
- Further training be provided for general dental practitioners on orthodontic referral
- Discussions with the local dental committee and managed clinical networks
- Further integration and discussions between primary and secondary care orthodontists on their acceptance criteria for NHS orthodontic treatments

REFERENCES
INTRODUCTION
The Peer Assessment Rating (PAR) Index is a valuable outcome measure for assessing patients who have undergone orthodontic treatment. This has also been shown to be valid for patients undergoing orthognathic surgery in combination with orthognathic surgery.

PAR score outcomes for such patients in Tayside and also in North West England have previously been published and this data provides some valuable benchmarks for services to measure their own outcomes against.

AIMS
To determine whether good occlusal outcomes, as determined by PAR Index assessment, are being achieved for patients having combined orthodontic / orthognathic surgery treatment at the hospital units in Devon and Cornwall.

STANDARDS
The standards set for the present audit were the same as used by McBride et al in the Tayside audit, which in turn were based on the O’Brien et al study of cases from North West England.

Standard 1
Mean Pre-treatment PAR score greater than 40.48

Standard 2
Mean Post-treatment PAR score less than 10.58

Standard 3
Mean improvement in PAR > 72%

Standard 4
< 40% of cases achieving less than 70% improvement in PAR

METHODS
Combined orthognathic treatments are undertaken at all the District General Hospitals in Devon and Cornwall, namely The Royal Cornwall Hospital, Derriford Hospital Plymouth, Torbay Hospital, The Royal Devon & Exeter Hospital and North Devon District Hospital (orthodontic phase only). All seven Consultant Orthodontists in Devon and Cornwall participated in the audit.

Cleft lip and palate patients from Devon and Cornwall who undergo orthognathic surgery receive the surgical aspects of their care from the Cleft Lip and Palate Service South West based in Bristol and were not included in this audit.

Each Consultant was asked to collate a list of all patients who had undergone combined orthodontic and orthognathic surgery treatment under their care. To obtain a meaningful sample size a period of 2 years 6 months was chosen. Patients were included if they had surgery between 1/1/2009 and 30/6/2011. Two Consultants identified that this inclusion period may produce an atypical number of cases due to the timing of their appointment to their Consultant post, or to changes in departmental timetables which influenced orthognathic activity rates. These two Consultants elected to use a slightly different inclusion period from 1/7/2009 to 31/12/2011 (still 2 years 6 months).

The Consultants obtained “start” and “finish” PAR scores for their cases, using the normal methodology in practice in their departments, which was different in some hospitals. In Truro, Exeter and Barnstaple, models were scored by trained and calibrated orthodontic technicians. In Plymouth and Torbay PAR models were scored by the Consultants, with some scoring their own cases, and others being scored by Consultant colleagues. All scorers had been trained and calibrated. The type of procedure undertaken was also recorded (single jaw maxilla, single jaw mandible or bimaxillary). Anonymous lists of cases and their scores were submitted to the lead auditor for analysis.

The start and finish PAR score was used to establish the numerical and percentage improvement for each case. These figures were used to calculate the Mean Start PAR, the Mean Finish PAR, Mean percentage improvement and the percentage of cases which achieved less than 70% improvement. The outcomes were then compared to the audit standards taken from the previously published studies. Each Consultant also received feedback about the audit outcomes for their personal cohort of cases.

RESULTS
179 patients were identified as having had orthognathic surgery in Devon and Cornwall over a two and a half year period. This equates to a mean 10.2 cases per Consultant per annum, with a range from 5.7 to 18.8. Two cases could not be audited because treatment had not been completed at the time of the audit, and a further 2 cases could not be audited because study models were missing. A total of 175 cases were audited.

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Number in present audit</th>
<th>Percentage</th>
<th>O’Brien et al. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bimaxillary</td>
<td>105</td>
<td>60%</td>
<td>66%</td>
</tr>
<tr>
<td>Maxilla only</td>
<td>15</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>Mandible only</td>
<td>55</td>
<td>31%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Table 1. Distribution of the different types of surgery in the present study and O’Brien et al.

<table>
<thead>
<tr>
<th></th>
<th>Audit Standard</th>
<th>Actual score</th>
<th>Achieved or not achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean start PAR</td>
<td>40.48 or greater</td>
<td>39.90</td>
<td>Not achieved</td>
</tr>
<tr>
<td>Mean finish PAR</td>
<td>10.58 or less</td>
<td>5.63</td>
<td>Achieved</td>
</tr>
<tr>
<td>Mean % improvement</td>
<td>Greater than 72%</td>
<td>85.51</td>
<td>Achieved</td>
</tr>
<tr>
<td>5 of cases &lt; 70% improved</td>
<td>Less than 40%</td>
<td>8%</td>
<td>Achieved</td>
</tr>
</tbody>
</table>

Table 2. PAR score outcomes for the entire sample of 175 cases with reference to audit standards.
Within this sample for Devon and Cornwall, the standard set was exceeded for the following variables: individual consultants, finish PAR scores and mean percentage improvement. Similarly, the percentage of patients achieving less than 70% improvement in their PAR score was significantly better than the standard, both for the entire sample and for each Orthodontist. For the entire sample, start PAR scores did not achieve the audit standard of 40.48. Two Orthodontists had mean start PAR scores which achieved the standard but 5 did not. Most of those who did not achieve the standard for mean start PAR score were very close.

DISCUSSION
Although the routine process for obtaining PAR scores was different in different hospitals, all scorers were trained and calibrated. There seems no reason to believe that the scores thus obtained are not objective.

The geography of the Devon and Cornwall peninsula provides an unusual opportunity to study a population that is unlikely to seek care out-with the locality. It would seem reasonable to conclude that the sample audited here is a very typical case mix for District General Hospital orthognathic services. The distribution of the different surgical procedures is very similar to those published elsewhere which further suggests that the sample is a valid one.

The standards adopted in the present audit were based on previous published studies which both had substantially smaller sample sizes. The Tayside study looked at 24 cases. The North West England study captured 94 patients but only 71 had complete sets of data. It is not clear from that paper how many patients of the 94 had complete PAR scores available. The 175 cases audited here were treated in 5 hospitals, by 7 Consultant Orthodontists working with 10 Consultant Oral and Maxillofacial Surgeons. As such the audit reflects a wide range of clinical practice.

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CONCLUSION
Good occlusal outcomes, as determined by PAR Index assessment, are being achieved for patients having combined orthodontic / orthognathic surgery treatment at the hospital units of the South West Regional Audit Group (Southern section). After discussion at the Regional Audit Meeting, it was felt that the Standard set here for “Mean Start PAR” may have been unrealistically high, particularly bearing in mind that the earlier audit of McBride et al also adopted this as an audit standard, and also failed to meet the standard. In view of the large and comprehensive sample size, the results reported here may well become valuable audit standards for other services to adopt when auditing occlusal outcomes for orthognathic cases.

ACKNOWLEDGEMENTS
We would like to acknowledge the Consultant Oral and Maxillofacial Surgeon colleagues who contributed significantly to the care of the cases audited here: Mr S Adcock, Mr J Bowden, Mr D Courtney, Mr D Cunliffe, Mr M Esson, Miss L Fryer, Mr G Jones, Mr C Lansley, Mr A McLennan, Mr J Parker

REFERENCES

ORTHOGNATHIC SURGERY PRECISION – A RETROSPECTIVE AUDIT OF PLANNED AND ACTUAL MOVEMENTS DURING MAXILLARY SURGERY

Hannah Barry, Preeyan Shah, Hashmat Popat and Andrew Cronin

aUniversity Dental Hospital, Cardiff & Vale University Health Board
bSchool of Dentistry, Cardiff University

INTRODUCTION
Orthognathic treatment planning is a multi-disciplinary approach, with the orthodontist, surgeon and technician working closely together to provide the best possible outcome. There are several methods available to plan orthognathic surgery and these techniques have become more accurate and sophisticated over the past few decades. Traditionally, planning was carried out by hand tracing lateral cephalometric radiographs but more contemporary approaches use computer-simulated software. There are however several sources of error that can lead to inaccuracies in the final surgical outcome. Lateral cephalometric tracing (landmark identification/analysis) and superimposition can cause mean errors in horizontal and vertical dimensions of more than 0.5mm. Impression taking, face-bow recording, model articulation and surgical splint fabrication have been shown to have a combined error of up to 1mm. It is therefore important to compare planned surgical movements with actual outcome so that discrepancies in the care pathway can be identified. In this manner the quality of care provided to the patient can be monitored.

AIM
To assess the difference between planned and actual skeletal change during maxillary surgery using hard tissue landmarks on lateral cephalometric radiographs.

STANDARD
Based on previous published literature in the field, surgically planned hard tissue landmark positions (x, y) should be within 2mm of the actual surgical outcome. Therefore the standard adopted for this audit is that 90% of surgical procedures should deliver the planned position of the maxilla to within 2mm.

PROCESS/MATERIALS AND METHODS
This was a retrospective audit that compared the pre-surgical and post-operative lateral cephalometric radiographs for patients that had maxillary surgery (single jaw or part of a bimaxillary osteotomy) from January 2010 to December 2011 at the University Dental Hospital in Cardiff. Patients were included if they had pre-surgical and post-operative lateral cephalometric radiographs available along
with a clear surgical plan written in the notes. Patients were excluded from the audit if they had cleft lip or palate deformities or other soft and hard tissue abnormalities that may have previously been corrected, isolated genioplasty or rhinoplasty procedures. Patients who had surgical assisted rapid maxillary expansion or other transverse skeletal corrections were also excluded.

All radiographs were taken digitally in the same department using a Sirona Orthophos 3 machine. The pre-surgical radiographs were taken following orthodontic decompensation, and post-operative radiographs were taken between 2 and 6 weeks after surgery. Radiographs were uploaded onto Dolphin Imaging™ Version 10 (Patterson Dental Supply) software programme at the same resolution (1280 x 1024 pixels). All pre-operative and post-operative radiographs were traced by one person using the Eastman Analysis. The pre-surgical radiograph was superimposed onto the post-operative radiograph on the Sella-Nasion line at Sella. The differences in the x-y position of the mesio-buccal cusps of maxillary first permanent molar and the incisal edge of the maxillary central incisors between the pre- and post-operative radiographs were recorded. These values represented the actual surgical movements that occurred and were compared to the planned surgical movements as documented in the clinical notes. In calculating the mean differences between the planned and actual surgical outcome, the sign of the difference was overlooked as the sum of positive values (i.e. over-correction) and negative values (i.e. under-correction) would eliminate each other leading to an overestimate of accuracy. Therefore all values were converted to a positive sign for transparency. Intra- and inter-observer reliability was assessed by two of the authors (PS and HP) re-tracing 10 of the radiographs chosen by a random number generator a week later. Mean method error was highest for the mesio-buccal cusp of the upper first permanent molar in the x-plane at 0.9mm for inter-observer reliability.

**RESULTS**

Overall, 24 maxillary procedures were carried out. The distribution of differences and means between the planned movements and outcome for each case is shown in Table 1. In total, 9 cases fell short of the standard leaving 63% of cases delivered to within 2mm of the surgical plan. Planned horizontal maxillary molar and incisor movements (x) tended to be more accurate when compared to vertical movements (y) as shown in Table 1. The variations between the planned and actual movement were overall more accurate for the upper incisor when compared to the maxillary molar. Single movement maxillary procedures (i.e. advancement or impaction) were more accurate than multiple movements (e.g. advancement and impaction).

<table>
<thead>
<tr>
<th>Movement</th>
<th>Mesiobuccal cusp U6</th>
<th>U1 tip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dx (mm)</td>
<td>Dy (mm)</td>
</tr>
<tr>
<td>Maxillary advancement (n=8)</td>
<td>2.7*</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>2.2*</td>
<td>2.8*</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Mean</td>
<td>1.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Maxillary impaction (n=4)</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Mean</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Maxillary advancement and impaction (n=5)</td>
<td>1.2</td>
<td>2.2*</td>
</tr>
<tr>
<td></td>
<td>2.2*</td>
<td>2.5*</td>
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<tr>
<td></td>
<td>0.1</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>2.8*</td>
<td>0.2</td>
</tr>
<tr>
<td>Mean</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Maxillary differential impaction (n=4)</td>
<td>0.2</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>1.7</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>1.9</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Mean</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Maxillary advancement and differential impaction (n=3)</td>
<td>2.0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Mean</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Combined Mean</td>
<td>0.9</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Table 1 Differences in hard tissue positions between the planned movements and outcome (* indicates audit standard not met)
DISCUSSION

Overall the audit standard was not met with 9 cases falling outside the criteria of within 2mm between planned and actual movement. The results of this audit are less favourable to those found in other studies\(^1,4\) however the manner in which the results are interpreted should be considered. In developing a standard, cases in this audit have been taken on an individual level, whereas in research studies mean values have been quoted. As can be seen from this audit, if only the combined mean discrepancies were taken into consideration then the audit standard would have been met fully with all hard tissue movements within 2mm of the actual plan. On an individual level, combined movement of the maxilla were least accurate with only 50% of cases meeting the standard (6/12 cases). Single movements of the maxilla had an accuracy of 75% (9/12 cases).

All lateral cephalometric radiographs were taken within 6 weeks post-operatively but minor movements due to finishing orthodontics may have skewed the results slightly. This however was not a factor under control of the audit as clinical need presided.

Sources of error should also be considered with landmark identification having the potential to influence the accuracy of a surgical outcome particularly since superimposition and a lack of detail in some areas of a cephalograph can make consistent identification for subsequent images difficult. In the audit conducted, horizontal and vertical discrepancies were greatest for the maxillary molar mesio-buccal cusp tip. This is most likely due to superimposition but may also be due to poor detail in this area when compared to the incisor region. Additionally variation in the width of the first maxillary molar can make identification more difficult. Comparably, the accuracy of horizontal incisor placement can be attributed to more control over the position of the central incisors and the horizontal position playing an essential role in the overall aesthetic outcome\(^3\).

The vertical position of the maxilla is also important but there is some scope for movement and the surgeon may change the vertical position during surgery. Pospisil et al reported that 33% of surgical inaccuracies resulted from a change in the surgical plan\(^5\). This may be due to unforeseen factors, anatomical variation (e.g. Pterygoid plate inclination), surgical complications and aesthetic reasons.

Landmark identification may not be consistent due to difficulties in tracing the cephalometric radiograph. However hand tracing, particularly when conducted by the same examiner, can provide consistent and comparable cephalometric readings. Power et al concluded that for majority of points, Dolphin Imaging™ can provide readings that are comparable with hand tracing but for a number of points it is less reliable and this must be considered as a source of error\(^6\).

Sharifi identified inaccuracies with the face bow recording, the intermediate wafer, and auto-rotation of the mandible in the supine or anaesthetized patient to be the principal reasons for errors in orthognathic planning. The maxilla tended to be under-advanced and over-impacted anteriorly when compared to predictions from the model surgery. However, none of these differences were statistically significant\(^7\).

CONCLUSION/PLAN

This audit has highlighted that 37% of maxillary movements in this sample of cases were outside 2mm of their predicted position in either the horizontal and/or vertical directions. These represented the more complex movements, particularly differential maxillary impactions, are more likely to show variability with the position of the maxilla. A reliable method of controlling the vertical height of the maxilla could improve on the accuracy of this procedure – currently the surgeon uses soft silicone surgical splints – hard acrylic splints will now be specified for multi-directional maxillary movements. Additional information such as patient reported outcome measures and occlusal indices would be useful to supplement the information collected as part of this audit. For example did the inaccuracies found in this audit impact on the outcome at the clinical or patient level? This audit will be repeated in 12 months time with this additional information to complete the audit cycle.

REFERENCES

INTRODUCTION
Mini-screws, also known as Temporary Anchorage Devices (TADs) or mini-implants, provide additional anchorage in a variety of cases. Mini-screws can be used in cases with reduced support, such as periodontally-involved adults and hypodontia patients, orthognathic cases, as well as in routine cases for antero-posterior support for labial segment retraction, molar distalisation, space closure, vertical support for intrusion and extrusion of teeth and transverse support to aid correction of centre-lines and alteration of the occlusal plane.

Stability of the mini-screw is gained from mechanical retention rather than osseo-integration. A number of factors can affect stability:
- Patient factors: age, mandibular plane angle, smoking status
- Local factors: maxilla or mandible, anterior or posterior, buccal or palatal, gingival attachment, presence of inflammation
- Implant design: length, diameter, self-tapping or self-drilling
- Insertion technique: placement torque, clinician experience, proximity of root

Successful mini-screw placement has been defined as: “static force tolerance for 6 months to one year”. Screws with minor mobility can, however, still be successful. Variable success rates have been reported, ranging from 78.6% to 93.6%. It is essential that the success rate of mini-screws is closely monitored and audited, to identify problems, aid learning and, most importantly, to ensure a high level of patient care.

AIMS
The objective of this audit was to determine the effectiveness of orthodontic mini-screws placed within Leeds Teaching Hospitals NHS Trust:
- To identify success and failure rates
- To identify complication/adverse response rates
- To compare the success rate in Leeds with the results of the on-going BOS national audit

STANDARDS
The gold standards used in the on-going BOS national mini-screw audit, which are based on NICE guidelines, were employed:
- Written information given to patients: 100%
- Documented discussion re: procedures and risks: 100%
- Signed consent form: 100%
- Screw lost/removed before anchorage completed: <20%
- Anchorage provided without adverse effects: >70%
- Infection/inflammation around screw resulting in loss: <20%
- Damage to neighbouring tooth: 0%
- 70% overall success rate (80% in maxilla, 60% in mandible)

MATERIALS AND METHODS
The audit was undertaken in the Orthodontic Departments of Leeds and Seacroft Hospitals. Each clinician collected data prospectively at the time of mini-screw placement and removal using a standardised data capture sheet. The period of data collection extended from July 2008 – July 2013. All patients who underwent mini-screw placement were included in the audit. If the data form was incomplete, the data was obtained from the original clinical records where possible. One individual (DOM) was responsible for uploading the data to the BOS.

RESULTS
A total of 75 mini-screws were placed; 15 in the palatal maxilla, 42 in buccal maxilla and 18 in the mandible. Infinitas™ (DB Orthodontics) screws were used in all cases. Consent was obtained for all patients, although written information was not recorded as having been provided for two mini-screws placed in one patient (97% compliance). Documentation that discussion of the procedures and risks had taken place was recorded for 100% of patients.

Eleven mini-screws were still in situ at the time of data analysis. Of the 64 mini-screws that had been removed, 30 (47%) were removed early due to failure and 34 (53%) were electively removed once anchorage requirements were met. Success rates for mini-screws were 54% in the mandible and 50% in the maxilla. The national success rate, obtained from the June 2013 British Orthodontic Society audit report, was 79%.

Figure 1 shows the reported causes of mini-screw failure. The majority of failures were due to mobility (19 mini-screws) and/or inflammation (9 mini-screws). Infection was a reported complication for two mini-screws.

Figure 2 shows the reported adverse effects of all mini-screws placed, regardless of whether the mini-screw was successful. Adverse effects were reported in 30 of the 64 mini-screws (47%) in which full anchorage provision was achieved. The most commonly reported adverse effects were mobility and inflammation, seen in 21 and 12 mini-screws respectively. One mini-screw was recorded as having caused root damage to adjacent teeth.
The 47% failure rate found for mini-screws placed in Leeds exceeded the audit target of <20% and was considerably higher than the results from the BOS national audit. Similarly, adverse events were reported in 30 of the 64 mini-screws (47%) in which full anchorage provision was achieved. This exceeds the audit gold standard set of <30%.

Compliance with consent and documentation in notes was excellent at 100%. However, the finding of 97% compliance for provision of written information fell short of the audit gold standard set of <30%.

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INTRODUCTION
Ectopic maxillary canines are frequently encountered by both general dental practitioners and orthodontic specialists. It is the second most commonly impacted tooth, after the mandibular third molar, with a prevalence of 0.92%-2.4%. Palatal impaction is approximately three times more likely than buccal impaction. The aetiology of the ectopic maxillary canine is multifactorial, due to either genetic factors or local factors such as peg shaped or absent lateral incisors, crowding or retained deciduous teeth.

Management of established canine impaction often requires both orthodontic and surgical intervention. Palatally impacted canines can be surgically treated with either an open or closed exposure technique. Immediately following open exposure a periodontal dressing (Coe pak) or coverplate is often placed whereas a gold chain is bonded to the impacted canine during the closed exposure technique. Many studies claim advantages and disadvantages of each exposure technique, however a recent Cochrane Collaboration Systematic Review was unable to find any evidence to support the use of one technique over the other.

Occasionally a second surgical procedure may be required to expose the impacted maxillary canine. Common causes of re-exposure include soft tissue overgrowth or gold chain debonding. On review of the literature it appears that surgical re-exposure rates of impacted maxillary canines vary between 2%-6%.

AIMS:
The aims of this audit were to investigate:

- The surgical re-exposure rates of palatal maxillary canines in the Oxfordshire, Berkshire and Buckingham region.
- The reasons for surgical re-exposure.

STANDARDS
The gold standard for surgical re-exposures should be <5% as determined by previous reports.

METHOD
Patients included in this audit were from four regional Oral and Maxillofacial Surgery Units in the Oxfordshire, Berkshire and Buckingham region: Unit 1, 2, 3 and 4. Patients were referred by both primary care and secondary care specialist orthodontists. Data were collected retrospectively for all patients undergoing palatal canine exposure between October 2011 and September 2012. Patients were identified from theatre logbooks and minor oral surgery lists. Patients were only included if all written case records were available. Patients were excluded if the position of the canine was not recorded or the patient records could not be located.

RESULTS
One hundred and sixty-eight patients in total were identified that met the inclusion criteria. 57% of patients were female and 43% male. In total, 192 palatal canines were exposed (Figure 1). These comprised 105 (55%) closed exposures and 87 (45%) open exposures. Overall, the re-exposure rate was 4.6%.

For those canines undergoing closed exposure, 2 out of 105 canines required re-exposure (2%). In both cases failure was attributed to debonding of the gold chain. In contrast, for canines undergoing open exposure, 7 out of 87 canines required re-exposure (8%). In all cases failure was due to soft tissue overgrowth following the initial exposure. Individual surgical re-exposure rates varied across the regional units: Unit 1 - 4.5%; Unit 2 - 2%; Unit 3 - 14%; Unit 4 - 0%.

DISCUSSION
This audit showed that the overall surgical re-exposure rate of ectopic maxillary palatal canines was 4.6%, which meets the gold standard. Similar figures ranging from 2%-6% have been shown in other regions in the UK.

87 (45%) open exposures. Overall, the re-exposure rate was 4.6%.

For those canines undergoing closed exposure, 2 out of 105 canines required re-exposure (2%). In both cases failure was attributed to debonding of the gold chain. In contrast, for canines undergoing open exposure, 7 out of 87 canines required re-exposure (8%). In all cases failure was due to soft tissue overgrowth following the initial exposure. Individual surgical re-exposure rates varied across the regional units: Unit 1 - 4.5%; Unit 2 - 2%; Unit 3 - 14%; Unit 4 - 0%.

The re-exposure rate for closed exposures of 2% (2 out of 105 canines) in this audit, is identical to that recorded by Gutierrez et al at Chesterfield Royal Hospital. Both failures, due to gold chain debonding, occurred at Unit 1, where canines were bonded by surgeons using self-etching primer from 3M Unitek. No failures were recorded at the other units. At both Unit 2 and Unit 3 gold chains were bonded using a 2 stage etch and primer bonding technique.

In our audit, the re-exposure rate for open exposures of 8% (7 out of 87 canines) falls below the gold standard. In addition, it is higher than that reported by Ponduri et al (6%) at the Queen Alexandra Hospital, Portsmouth. All failures were due to soft tissue overgrowth. On further analysis it was noted that Unit 3 accounted for 5 of these failures with the remaining two failures occurring at the Unit 1 and Unit 2. In 5 of the 7 failure cases, no cover plate was provided. This audit did not assess whether adequate bone/soft tissue was removed at the time of surgical exposure or the post operative oral hygiene of the patient, which would also account for failure in the open exposure group.
Our study highlighted a difference in re-exposure rates between the open and closed technique. This is in contrast to the Cochrane Review, where no difference in surgical re-exposure rates was concluded for the two techniques\(^7\). One limitation of this audit is that we were unable to follow up cases referred from primary care. In these cases, success was recorded if the cases were not re-referred for re-exposure.

**CONCLUSIONS**

- The surgical re-exposure rate for maxillary palatal canines met the gold standard (4.6%)
- The surgical re-exposure rate was lower for the closed exposure technique (2%) than the open exposure technique (8%)
- The underlying reasons for re-exposure were gold chain debonds and soft tissue overgrowth

**RECOMMENDATIONS**

- Use of coverplate may be preferable in an open exposure technique
- Re-audit in 2 years

**REFERENCES**


10 **DOCUMENTATION OF THE BASIC PERIODONTAL EXAMINATION SCORES AS PART OF THE ORTHODONTIC EXAMINATION FOR NEW PATIENTS: A TWO-CYCLE AUDIT**


**INTRODUCTION**

Numerous studies have reported on the onset of gingival inflammation with fixed appliance therapy. Ericsson et al. (1978) showed that the use of fixed appliances in a patient with an inflamed periodontium may lead to definite angular bony defects. It is therefore important to diagnose and manage appropriately pre-existing periodontal inflammation in patients prior to fixed appliance therapy. An assessment of each patient’s oral hygiene status alone is insufficient as periodontal disease may be due to a non-plaque aetiology such as defects in neutrophil function or connective tissue metabolism. The examination of radiographs aid in the diagnosis of bone loss, however, it is not indicative as to whether the condition has been treated or is pre-existing. The basic periodontal examination (BPE) has been shown to be a quick and effective method of diagnosing the disease and is a systematic method of examining for the presence of periodontal disease and quantifying its severity.

General dental practitioners should ensure that patients are caries free, periodontally stable and can sustain a level of oral hygiene that is sufficient to support orthodontic therapy prior to referral to the orthodontist. Unfortunately this is not always the case, and therefore without a periodontal screen to ascertain level of disease, it is possible for patients to commence orthodontic treatment with pre-existing periodontal disease. Many patients are referred in for possible active treatment rather than advice and it was therefore felt that a basic periodontal examination would be useful as part of the new patient assessment in order to avoid orthodontic treatment in cases where periodontal disease is active.

Although patients in the permanent dentition would be suitable for a full BPE, a lower age limit of 20 was chosen as recommended by Ainamo et al. (1984) in order to allow the best use of limited resources.

**AIMS**

1. To identify whether patients aged 20 and above have a Basic Periodontal Examination (BPE) carried out in new patient consultant orthodontic clinics.
2. To ascertain whether appropriate onward referrals are made in order to manage pre-existing periodontal disease.

**GOLD STANDARD**

The British Society of Periodontology (2001) states that all new patients attending dentists for the first time should have a BPE recorded\(^6\). The gold standard for recording a BPE score at the time of assessment in adult patients was therefore set to 100%.
<table>
<thead>
<tr>
<th>BPE score</th>
<th>Interpretation</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No pockets &gt;3.5 mm, no calculus/overhangs, no bleeding after probing (black band completely visible)</td>
<td>No need for periodontal treatment</td>
</tr>
<tr>
<td>1</td>
<td>No pockets &gt;3.5 mm, no calculus/overhangs, but bleeding after probing (black band completely visible)</td>
<td>Oral hygiene instruction (OHI)</td>
</tr>
<tr>
<td>2</td>
<td>No pockets &gt;3.5 mm, but supra- or subgingival calculus/overhangs (black band completely visible)</td>
<td>OHI, removal of plaque retentive factors, including all supra- and subgingival calculus</td>
</tr>
<tr>
<td>3</td>
<td>Probing depth 3.5-5.5 mm (black band partially visible indicating pocket of 4-5mm)</td>
<td>OHI, root surface debridement (RSD)</td>
</tr>
<tr>
<td>4</td>
<td>Probing depth &gt;5.5 mm (black band entirely within the pocket, indicating pocket of 6mm or more)</td>
<td>OHI, RSD. Assess the need for more complex treatment; referral to a specialist may be indicated.</td>
</tr>
<tr>
<td>*</td>
<td>Furcation involvement</td>
<td>OHI, RSD. Assess the need for more complex treatment; referral to a specialist may be indicated.</td>
</tr>
</tbody>
</table>

Table 1: Adapted from British Society of Periodontology document on BPE.

FIRST CYCLE
Method:
This was a retrospective audit looking at the clinical records of 90 patients who had attended for assessment in the Orthodontic Department of the Birmingham Dental Hospital. The cohort of patients aged 20 years and above that were audited were seen in new patient consultant orthodontic clinics between January and June 2010. The following data were collected:

1. Age of the patient at the time of the consultation
2. Evidence of a BPE examination
3. Record of the oral hygiene status
4. Grade of the clinician examining the patient
5. Evidence and type of onward referral to manage periodontal disease, if justified

Results
- Sixty percent of the patients were seen by registrars and 30% were seen consultants. Ten percent were seen by clinical assistants.
- Six percent of patients had the BPE recorded
- Eighty three percent of the patients had an OH status recorded
- The majority of the adult patients examined in the audit were aged between 20 and 39 with 70% aged between 20 and 29.
- Onward referrals for addressing the periodontal condition were made for 8 patients: five of those were to the GDP and the remaining 3 were to the periodontology department in the Dental hospital. Three referrals were made in the absence of BPE scores.

Changes to clinical practice
Following completion of the first cycle, the results and information on actions to be implemented were disseminated to the orthodontic team at the Birmingham Dental Hospital and the consultants in the West Midlands at the regional audit meeting. Several changes were made in order to encourage clinicians to perform a BPE examination as part of their routine examination. The new patient assessment proforma sheet was modified to include a section for documentation of the BPE scores and the addition of a WHO probe was made to the examination kits.

SECOND CYCLE
Method:
The second cycle consisted of examination of 90 clinical records of patients aged 20 and above seen in new patient orthodontic clinics between January 2013 and June 2013. All data collected in the first cycle was included in the second cycle, and also a note made of which proforma sheet was used (original or modified).

Results
The age of patients was similar to the cohort in the first cycle with the majority being between the age of 20 and 39. Fifty-five out of 90 patients (61%) had a BPE recorded. Of these 55 records, 43 used the updated proforma and 12 used the old proforma sheet. Onward referrals for addressing the periodontal condition were made for 13 patients: eight referrals were made to the GDP and 5 referrals were made to the department of periodontology at the Birmingham Dental Hospital. The oral hygiene status was recorded for all patients.

Comparison of the 1st and 2nd cycle

![Figure 1: Results of initial audit and second cycle](image)

![Figure 2: Results of the second cycle also demonstrate what proportion of records had a BPE recorded when the modified proforma sheet was used.](image)
Figure 1 shows that records of 90 patients were examined for both cycles. There was an improvement for all variables examined which included the documentation of the oral hygiene status and recording of the grade of clinician. A significant improvement was made in the recording of BPE from 6% in the first cycle to 61% in the second cycle and a concomitant increase in the number of referrals for the management of the periodontal condition in the second cycle.

Figure 2 shows that 45 of the 55 BPE records were made in the revised proforma sheet and 12 of the 35 were made in the previous proforma sheet.

**DISCUSSION**

The results of both cycles showed that the documentation of BPE fell short of the gold standard, however there was a significant improvement for the recording in the second cycle. The number of referrals for the management of the periodontal condition also increased in the second cycle, possibly through a greater number of patients diagnosed with periodontal disease. This highlights the effectiveness of the updated proforma sheet and the raised awareness as a result of disseminating the results from the 1st cycle and implementing changes to encourage clinicians to perform a BPE.

The introduction of the new proforma sheet and supply of WHO 621 and CPITN probes in exam packs has been successful in improving compliance with current guidelines.

**CONCLUSION**

1. There has been a modest improvement in the recording of the BPE scores although it still falls short of the gold standard.
2. The revised proforma sheet has encouraged clinicians to record the BPE.
3. A greater number of referrals have been made as a result of the increase in the number of patients diagnosed with periodontal disease.
4. This audit highlights the need for a re-audit following distribution of the results of the re-audit to the orthodontic team at Birmingham Dental Hospital.

**REFERENCES**

METHODS

Patients who had undergone orthognathic surgery (Bimaxillary Osteotomy, Le-Fort 1 Osteotomy, Bilateral Sagittal Split Osteotomy (BSSO)) between January 2012 and May 2013 were identified from laboratory records of wafer production. Prior to the commencement of this study, a letter was sent out to all patients regarding our intention to carry out a telephone survey to assess their experience with orthognathic surgery and the overall care received. Patients were given an option to opt-out of the survey should they wish not to be contacted and this would not affect their on-going care.

A modified version of a validated questionnaire was used and a copy of this was also attached with the letter. Patients who did not opt out were contacted by telephone at least one month after being discharged from the hospital following surgery to complete the survey. All answers to the questionnaire were recorded by one investigator for consistency.

The information collected was entered on to a coded data collection sheet which was kept securely and separately from the main patient information to protect patient confidentiality.

RESULTS

The total of 33 patients underwent orthognathic surgery between January 2012 and May 2013. Of these, 32 patients were successfully contacted to complete the questionnaire, giving a response rate of 97%. 75% (n=24) had bimaxillary osteotomy while 12.5% (n=4) had Le-Fort 1 Osteotomy and BSSO respectively.

Post-operative symptoms

The reported post-operative symptoms in relation to patient expectations are shown in table 1.

Table 1 – Reported post-operative symptoms in relation to patient expectations

<table>
<thead>
<tr>
<th>With symptoms</th>
<th>More than expected</th>
<th>As expected</th>
<th>Less than expected</th>
<th>Total with symptoms</th>
<th>Without Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>8 (25)</td>
<td>8 (25)</td>
<td>16 (50)</td>
<td>32 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Swelling</td>
<td>23 (72)</td>
<td>8 (25)</td>
<td>1 (3)</td>
<td>32 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Bruising</td>
<td>12 (38)</td>
<td>6 (19)</td>
<td>10 (31)</td>
<td>27 (84)</td>
<td>5 (16)</td>
</tr>
<tr>
<td>Difficulty eating</td>
<td>12 (38)</td>
<td>16 (50)</td>
<td>2 (6)</td>
<td>30 (94)</td>
<td>2 (6)</td>
</tr>
<tr>
<td>Breathing difficulty</td>
<td>8 (25)</td>
<td>1 (3)</td>
<td>1 (3)</td>
<td>10 (31)</td>
<td>22 (69)</td>
</tr>
<tr>
<td>Numbness</td>
<td>13 (41)</td>
<td>15 (47)</td>
<td>2 (6)</td>
<td>30 (94)</td>
<td>2 (6)</td>
</tr>
</tbody>
</table>

The reported post-operative symptoms in relation to patient expectations are shown in table 1.

Data are number (%) of patients

All patients who underwent orthognathic surgery experienced post-operative pain and swelling. The majority however reported the pain to be less than expected while swelling was reported to be more than expected. The reported level of pain on a scale of 1 to 5 had a normal distribution. Numbness and difficulty eating was the same reported incidence and were both largely more than or as expected. 94% of patients reported difficulty in eating and only 41% (n=13) of patients reported that the food provided on the ward was appropriate ‘most of the time’. The majority of patients (80%, n=8) who experienced difficulty breathing found it to be more than expected. 70% (n=7) of the patients rated this to be ≥3 on a scale of 1 to 5 where 5 is very frightening.

Recovery

41% (n=13) of patients reported that recovery took longer than expected while for 44% (n=14) and 15% (n=5) of patients, the recovery was as long as and shorter than expected respectively.

75% (n=24) of patients report at least one or a combination of residual problems since surgery as shown in Table 2.

Table 2 – Residual problems reported by patients

<table>
<thead>
<tr>
<th>Residual problem</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty eating</td>
<td>4 (12.5)</td>
</tr>
<tr>
<td>Numbness</td>
<td>19 (59)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (31)</td>
</tr>
</tbody>
</table>

Problems at home

The main issue patients had at home were problems with eating. A patient reported not knowing what types of foods were appropriate. The majority however attribute this problem to swelling and pain which is also related to problems with sleeping. Two patients also had problems with painkillers provided by the ward. They could not swallow the tablets provided and therefore did not have appropriate pain relief at home. Other issues raised were difficulty with oral hygiene, unexpected nose bleeds and difficulty with placing elastic bands.

Motivation for surgery

59% (n=19) of patients stated improving facial appearance to be one of the motivations of undergoing orthognathic surgery. Other reasons stated are to improve speech (n=2), ability to eat (n=10), self confidence (n=3) and align jaw (n=10). Three patients stated ‘orthodontist advised’ as their sole reason for treatment.

Pre-operative information

Patients generally felt that they were ‘well’ or ‘very well’ informed about the surgery and overall treatment as shown in Figure 1.

![Figure 1 – Patients perception of information provided prior to surgery](image-url)
The ultimate test of satisfaction is whether patients would choose to undergo the same surgery if they could choose again. 78% of patients said they would have undergone the surgery knowing what they now know (Figure 2).

Knowing what you now know, would you still have undergone the surgery?

![Pie chart showing responses]

**Figure 2 – Patients reported willingness to undergo orthognathic surgery having been through surgery**

**DISCUSSION**

The response rate for the survey is very high at 97% (n=32) due to the method of survey. A telephone survey method was chosen due to the relatively small sample size and ability of obtaining qualitative data through this method. None of the patients opted out of the telephone survey and one patient failed to respond due to wrong telephone number provided in their hospital records.

The majority of patients reported less pain than expected post-surgery possibly due to effective pain relief provided at the hospital and on discharge. This is also reflective of the information provided prior to surgery which prepares patients for post-operative symptoms. Patients need to be better informed about the swelling and difficulty breathing that can be expected post-surgery as 72% and 80% of patients with symptoms reported this to be worse than expected respectively. Information given about difficulty eating and numbness post-operatively can be improved as approximately 40% reported this to be ‘more than expected’.

The provision of appropriate food in the wards needs improvement as only 41% of patients reported this to be appropriate most of the time. 6 patients complained that they were served inappropriate foods such as fish and chips on the ward.

Even though 75% (n=24) of patients still experience a residual problem since the surgery, 78% (n=25) of patients would still choose to undergo the surgery having been through it. We can deduce from this that patients gained overall benefit from the surgery despite post-operative complications.

The overall reported post-operative experience falls short of the gold standard (100%) as a proportion of patients reported symptoms to be worse than expected for all symptoms investigated. Despite this, patient satisfaction with the information provided regarding the surgery and overall procedure was 87.5% and 84% respectively. This trend in relatively high satisfaction with information provided despite worse post-operative symptoms than expected is similar with results from other comparable studies.

This study is at risk of bias as there is a wide variation in time since the patients were operated on. It is known that the severity of long-term side effects such as numbness changes as time progresses and therefore the reported numbers may not be reflective of true incidence. The time lapse between the surgery and survey also introduces re-call bias. Operator bias is however minimised by having all surveys conducted by one investigator.

**CONCLUSION**

- The telephone survey achieved a response rate of 97%, proving it to be an effective method of surveying patients.
- Patients are well informed about post-operative pain, and this is managed effectively.
- Patients need to be better informed about post-operative swelling, bruising and difficulty breathing.
- The ward needs to be more aware of patients needs and serve appropriate food.
- The main problems faced by patients at home were mainly related to dietary needs.
- Orthognathic surgery provides an overall benefit to patients’ well being. 78% of patients would still choose to undergo the surgery having been through it. 87.4% and 85% of patients felt well informed about the surgery and overall procedure respectively.

**PLAN**

- Design a post-operative care leaflet to be given to patients before the surgery so they can be prepared for the post-operative care required.
- Discuss with ward manager to provide education on management of patients following orthognathic surgery, particularly relating to dietary needs.
- Re-audit patient experience after one year to see if the changes implemented improve patient experience.
- Re-audit patients who were interviewed to review post-operative problems and changes in their view towards their experience after a longer period of time.

**REFERENCES**

A REGIONAL AUDIT OF ORTHOGNATHIC SERVICE PROVISION AND TREATMENT DURATION

A. Tsichlaki1, S. Ward2. University Dental Hospital Manchester1, Royal Blackburn Hospital2

INTRODUCTION
Patients potentially requiring combined orthodontic and orthognathic treatment are initially asked to attend a joint clinic for further treatment planning. During this visit, further information is offered regarding the procedures involved and their risks and benefits. In addition, an estimation of anticipated duration of the various treatment stages is given. Knowledge of treatment process and duration are important not only for service organisation and treatment planning, but also for informed patient consent to be valid1. It has also been found that accurate information and communication is likely to result in patients being more satisfied with their overall treatment2,3.

AIMS
The aims of this audit were to evaluate the process of combined orthodontic-surgical treatment across hospital units in the North West of England and determine whether any improvements to the service need to be made.

STANDARDS
There are no set national guidelines as to what constitutes a gold standard for treatment duration, so the gold standards for this audit were devised from similar published studies in the UK3,4.

It was agreed that 90% of patients should meet the following targets:
1. Total treatment should be completed within 30 months
2. When ready for surgery no patient should wait more than 4 months
3. Fixed appliances should be removed within 6 months after surgery

MATERIALS AND METHODS
We carried out a multicentre retrospective regional audit of all patients having undergone orthognathic surgery between 1st January 2011 and 31st December 2011 inclusive. This enabled a post-operative period of at least one year during which the orthodontic treatment should have been completed. The dates of the various stages of treatment were retrieved through reviewing clinical notes and this information was recorded on a data collection sheet. Data were collected by one author visiting the different units, with the exception of one hospital which submitted their own data. Dates were recorded for the following: initial contact, joint clinic, bond-up, end of decompensation phase, pre-operative joint clinic, surgery and debond. Number of operation cancellations and nights of hospital in-stay were also recorded on the same proforma. No information was recorded regarding the treating clinicians, surgeons and procedures undertaken, as this was not always practical. Data were analysed in SPSS v20 using descriptive statistics.

RESULTS
Data were collected from five regional hospitals, however, University Hospital of South Manchester is the surgical provider for orthognathic treatment undertaken at Stockport NHS Foundation Trust as well, so data are presented jointly for these two centres. A total of 77 patient notes were identified and audited. Statistics on numbers of patients audited from each hospital together with the total number of patients having undergone surgery in that year are shown below (n audited / n total): Royal Blackburn Hospital (41/49), Fairfield General Hospital, Bury (10/10), University Dental Hospital of Manchester (13/14) and Stockport NHS Foundation Trust / University Hospital of South Manchester (13/26)

The discrepancy between the numbers audited and the total numbers were mainly due to the availability of notes and patients being unidentifiable from the surgical lists, which resulted in their notes being irretrievable.

Standard 1
The mean overall treatment time with appliances was 31.7 months (SD 11.3) for all the hospitals combined. Only one hospital had a greater than average treatment duration of 38 months, whereas for the remaining hospitals this averaged within the standard of 30 months (Figure 1. Mean overall appliance duration (months)). Overall only 53% of patients met the gold standard to have treatment completed within 30 months. None of the hospitals achieved the individual target of having 90% of their patients achieve this target. (Table 1. Percentage of patients (n=77) achieving standard).

Standard 2
The mean overall waiting time for surgery was 4.1 months (SD 3.1) for all the hospitals combined. One hospital had a much higher than average waiting time of around 7 months, while for the remaining 3 hospitals the wait was between 3 - 4.5 months (Figure 2. Mean wait for operation (months)). Overall 70% of patients met the gold standard of having to wait no more than 4 months for surgery and 2 hospitals achieved the target of having 90% of their patients achieve this (Table 1).

Standard 3
The mean overall duration of the post-operative orthodontic treatment was 5 months (SD 2.7) for all the hospitals combined. There were mild variations across the hospitals, with means ranging between 4.8 - 5.5 months (Figure 3. Mean post-operative orthodontic treatment duration (months)). Overall 77% of patients met the gold standard of having their braces removed within 6 months after surgery, but only 1 hospital had 90% of their patients meeting this target (Table 1). The average number of surgery cancellations (≈0.1) and nights of hospital stay (≈2.1 nights) were similar across all units.

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Standard 1 % (n)</th>
<th>Standard 2 % (n)</th>
<th>Standard 3 % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBH (41)</td>
<td>62 (23/37)</td>
<td>90 (35/39)</td>
<td>77 (27/35)</td>
</tr>
<tr>
<td>FGH (10)</td>
<td>20 (2/10)</td>
<td>90 (9/10)</td>
<td>90 (9/10)</td>
</tr>
<tr>
<td>UMDH (13)</td>
<td>73 (8/11)</td>
<td>50 (6/12)</td>
<td>73 (8/11)</td>
</tr>
<tr>
<td>UHSM/SHH (13)</td>
<td>30 (3/10)</td>
<td>15 (2/13)</td>
<td>69 (9/13)</td>
</tr>
<tr>
<td>Total (77)</td>
<td>53 (36/68)</td>
<td>70 (52/74)</td>
<td>77 (53/69)</td>
</tr>
</tbody>
</table>

Table 1 Percentage of patients (n=77) achieving standards
In our region, the gold standard was only met for the mean post-operative orthodontic treatment duration and orthodontic treatment was completed on average within 3 months following surgery. This was shorter than that reported by Jeremiah et al. and Luther et al., of 7.2 and 7.5 months respectively. Although our standards for overall treatment duration lasting no more than 30 months and mean wait for surgery less than 4 months were not met, our results are comparable to those in the East of England region, who reported a mean overall treatment time of 32 months and mean wait for surgery less than 4 months were not achieved but individual hospitals did achieve some. However, the caseload per unit needs to be assessed and explored further in order to enable better workforce planning. Individual hospitals need to also explore the possibility of proactively booking the joint clinic appointment approximately 12 months after the start of orthodontic treatment to help reduce overall treatment times, although understandably, this may not always be practical. All units need to ensure that patients receive accurate information regarding anticipated duration of the various stages of treatment at the joint clinic appointment. Currently, it is recommended that, patients should be told that overall treatment is expected to take around 32 months give or take a couple of months.

The two centres with the combined surgical service should also consider setting up joint clinics in both units, in order to reduce delays in the process occurring as a result of transfers between the centres, or potentially increasing the number of available surgeons and clinicians to minimize delays in surgery waiting times and overall treatment, respectively. A second cycle will be completed again in 36 months time to evaluate any improvements in the process, and since some of the staffing issues would have already been addressed, it is anticipated that results will be improved.

CONCLUSION / ACTION PLAN

Standards were only met for the post-operative orthodontic duration lasting less than 6 months. Overall targets were not achieved but individual hospitals did achieve some. However, the caseload per unit needs to be assessed and explored further in order to enable better workforce planning. Individual hospitals need to also explore the possibility of proactively booking the joint clinic appointment approximately 12 months after the start of orthodontic treatment to help reduce overall treatment times, although understandably, this may not always be practical. All units need to ensure that patients receive accurate information regarding anticipated duration of the various stages of treatment at the joint clinic appointment. Currently, it is recommended that, patients should be told that overall treatment is expected to take around 32 months give or take a couple of months.

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ACKNOWLEDGEMENTS

We would like to thank Mr P. Banks for his data contribution on Fairfield General Hospital, Bury.

REFERENCES

INTRODUCTION
A diet which has a low frequency intake of non-milk extrinsic sugars (NMES) is important in reducing the risk of dental caries. Patients wearing fixed orthodontic appliances are considered to be at greater risk of decalcification and dental caries due to the increased risk of plaque accumulation around brackets and bands, on composite surfaces, and on interfaces between the composite and enamel. Sugars from the diet are metabolised in this plaque resulting in demineralisation and, if the lesions progress, dental caries. Thus, as well as maintaining a high level of oral hygiene, orthodontic patients are required to maintain a diet which is low in the frequency and amount of NMES.

In addition, orthodontic patients are encouraged to avoid foods that are likely to damage their appliances as this may in turn prolong their treatment; the common instruction being to avoid hard and sticky foods. Dietary advice is routinely given at orthodontic appointments, however recent research within this department identified that 50% of patients would like more information on how fixed appliances affect eating.

AIMS
The aims of this audit were four fold:
1. To assess patients’ dietary habits whilst undergoing fixed appliance treatment.
2. To assess patients’ knowledge of the cause of dental decay.
3. To assess patients’ knowledge of the consequences of inappropriate dietary habits whilst undergoing fixed appliance treatment.
4. To determine whether patients feel they have been provided with sufficient information about what to eat and drink whilst wearing fixed appliances.

DESIGN AND SETTING
This was a prospective questionnaire audit carried out over a two week period in January 2012 in a postgraduate teaching hospital.

AUDIT STANDARDS
There were no set standards available in the literature; however the importance of dental health education and the restriction of sugary food and drink consumption in preventing dental caries has been documented in the literature. The audit standards were set by the authors following discussions at a departmental audit meeting prior to data collection:
• 100% of patients should appreciate the importance of limiting the intake of sugary foods, hard foods and fizzy drinks. Drinks containing sugar should be limited to meal times only.
• 100% of patients should be aware of the aetiology of dental caries and consequences of inappropriate dietary practices whilst wearing fixed appliances.
• 80% of patients should feel they have been provided with the ideal amount of information about correct dietary practice whilst wearing fixed appliances.

SUBJECTS AND METHOD
A questionnaire consisting of nine questions was designed by the authors (Appendix 1). There were five parts to the questionnaire which included:

1. Patient demographics; age and gender.
2. The aetiology of dental caries; this section asked patients what they thought caused tooth decay and provided a list of potential options. They were advised to tick as many options as they thought applied.
3. Dietary habits; this section asked patients if there were any foods they avoided whilst wearing fixed appliances. It also asked what they usually drank at meal times and in-between meals.
4. Consequences of inappropriate dietary advice; this section asked patients what they thought would happen if they ate or drank the wrong things during orthodontic treatment.
5. Information provision; the final part of the questionnaire asked patients if they felt they had been given enough information regarding what to eat and drink whilst wearing a brace.

With the exception of the first and final section of the questionnaire there was a list of responses following each question and patients were asked to tick all options that were correct or applied to them. Patients were also given the opportunity after each question to write additional information if their responses were not included. For the final part of the questionnaire patients were invited to make comments regarding the information they had received during treatment.

The questionnaire was then piloted on five patients to assess acceptability and readability. Changes made following the pilot included minor modifications to wording. The Flesch reading ease score for the questionnaire was 80% which represents a suitable reading level for the average 10 year old.

Questionnaires were handed out to 60 consecutive patients over a two day period. Patients were included in the audit if they were undergoing treatment involving fixed orthodontic appliances with orthodontic specialty registrars. There were no restrictions on age or medical history. Patients were excluded from the audit if they had not yet started treatment, were having treatment involving removable appliances only, were in retention or were attending for a review appointment. Patients were asked to complete the questionnaire at the end of their appointment.

RESULTS
The response to the questionnaire was 83%. Fifty patients completed the questionnaire of which 64% were female and 36% were male. The majority of the patients were aged 15-18 years old (42%), 30% were aged between 12-14 years and 16% were between 19-25 years of age. Twelve percent were aged 26 years or older. The results of questions number 3 to 9 are presented in tabular format (Tables 1-7).

<table>
<thead>
<tr>
<th>Causes of tooth decay</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque / food build up</td>
<td>84</td>
</tr>
<tr>
<td>Not cleaning teeth properly</td>
<td>78</td>
</tr>
<tr>
<td>Sugar</td>
<td>74</td>
</tr>
<tr>
<td>Bugs / bacteria</td>
<td>34</td>
</tr>
<tr>
<td>It happens over time anyway</td>
<td>8</td>
</tr>
<tr>
<td>It runs in families</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1. Responses to Question 3: What do you think causes tooth decay?
The majority of patients were aware that tooth decay is related to plaque, inadequate cleaning and consumption of sugar. Approximately a third of patients were aware that bacteria play a role in tooth decay and a small number of patients thought that tooth decay was a family trait and would happen eventually over time.

<table>
<thead>
<tr>
<th>Food</th>
<th>%</th>
<th>Food</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toffee</td>
<td>62</td>
<td>Nuts</td>
<td>24</td>
</tr>
<tr>
<td>Sweets</td>
<td>50</td>
<td>Biscuits</td>
<td>20</td>
</tr>
<tr>
<td>Hard fruit</td>
<td>42</td>
<td>Crunchy cereals</td>
<td>20</td>
</tr>
<tr>
<td>Dried fruit</td>
<td>40</td>
<td>Crackers</td>
<td>14</td>
</tr>
<tr>
<td>Hard raw vegetables</td>
<td>38</td>
<td>Crisps</td>
<td>10</td>
</tr>
<tr>
<td>Meat on bone</td>
<td>36</td>
<td>Cereal bars</td>
<td>8</td>
</tr>
<tr>
<td>Crusty bread</td>
<td>26</td>
<td>Other</td>
<td>20</td>
</tr>
<tr>
<td>Chocolate</td>
<td>24</td>
<td>None</td>
<td>16</td>
</tr>
<tr>
<td>Popcorn</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Responses to question 4: Are there any foods you avoid eating whilst wearing a brace?

Over half of patients avoided toffees and a half of patients avoided sweets. Just under a half of patients avoided hard fruit or dried fruit. Fewer than a third of patients avoided chocolate, nuts and biscuits and fewer than 15% avoided crackers, crisps and cereal bars. Twenty per cent of patients avoided foods that were not listed in the questionnaire (“other”) but unfortunately no comment was made on what these foods were.

<table>
<thead>
<tr>
<th>Drink</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>84</td>
</tr>
<tr>
<td>Fruit juice</td>
<td>36</td>
</tr>
<tr>
<td>Fruit squash</td>
<td>30</td>
</tr>
<tr>
<td>Fizzy drinks</td>
<td>22</td>
</tr>
<tr>
<td>Flavoured water</td>
<td>18</td>
</tr>
<tr>
<td>Tea or coffee with sugar</td>
<td>12</td>
</tr>
<tr>
<td>Tea or coffee without sugar</td>
<td>8</td>
</tr>
<tr>
<td>Milk</td>
<td>6</td>
</tr>
<tr>
<td>Flavoured milkshakes</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4. Responses to question 6: What do you drink at meal times whilst wearing a brace?

Water was the most popular drink for meal times. Approximately a third of patients drank fruit juice and fruit squash, and fewer than a third of patients drank fizzy drinks or flavoured water at meal times. A small percentage of patients drank tea or coffee with their meals, with more patients adding sugar to this type drink. Only six percent of patients drank milk at mealtimes and even fewer drank flavoured milkshakes.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break the brace</td>
<td>58</td>
</tr>
<tr>
<td>Stain the teeth</td>
<td>52</td>
</tr>
<tr>
<td>Cause tooth decay</td>
<td>42</td>
</tr>
<tr>
<td>Damage the teeth</td>
<td>34</td>
</tr>
<tr>
<td>Make the brace treatment longer</td>
<td>30</td>
</tr>
<tr>
<td>Wear away the teeth</td>
<td>16</td>
</tr>
<tr>
<td>Make bad bugs / bacteria in the mouth</td>
<td>16</td>
</tr>
<tr>
<td>Scar the teeth</td>
<td>12</td>
</tr>
<tr>
<td>Braces have to be taken off before the teeth are fully straight</td>
<td>8</td>
</tr>
<tr>
<td>Nothing</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 5. Responses to question 7: What happens if you eat or drink the wrong things whilst wearing a brace?

The most frequent responses to question 7 were breaking the brace or staining the teeth. Fewer than a half of the patients were aware that an incorrect diet caused tooth decay or caused damage to the teeth. Just under a third of patients thought that an incorrect diet would increase treatment time. A smaller number of patients thought an incorrect diet would lead to tooth wear or presence of bacteria in the mouth and 8% recognised that a poor diet may result in braces being taken off before the teeth were fully straight.

<table>
<thead>
<tr>
<th>Correct amount of information on dietary habits</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>78</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 6. Response to question 8: Do you think you have been given enough information on what to eat and drink whilst wearing a brace?

Seventy eight percent of patients felt that had been given the correct amount of information on dietary habits.
The majority of patients felt they had received adequate dietary advice. However, dietary habits and awareness about the cause of dental caries were obviously not adequate and could be improved amongst patients within the department. The following recommendations have been made:

1. Continue to identify dietary risk factors prior to commencing orthodontic treatment.
3. Dietary advice should include providing patients with information on appropriate dietary habits and the consequences of inappropriate dietary habits.
4. Ensure written information on dietary advice is easily accessible to all patients and ensure patients have read the relevant information.
5. Educate parents as well as patients on good dietary practice as adolescent orthodontic patients are likely to seek advice from their parents.
6. Re-audit to assess the impact of recommendations.

**REFERENCES**


<table>
<thead>
<tr>
<th>Comments made</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No comments</td>
<td>66%</td>
</tr>
<tr>
<td>Comments</td>
<td>34%</td>
</tr>
</tbody>
</table>

Table 7. Response to question 9: How can we improve the information given to you on what to eat and drink whilst wearing a train-track brace?

The final question asked patients for any additional comments and 34% of patients did add comments. These included:

- “I am happy with what my orthodontist has told me”
- “Provide a list of what to avoid eating”
- “Give me a leaflet”

**DISCUSSION**

A greater number of female patients responded to the questionnaire; this is likely to be due to the majority of orthodontic patients being female. The majority of patients were aged between 15 and 18 years of age, which would be expected in a NHS teaching hospital.

The results show that not all patients had ideal dietary habits, thus the audit standard was not met. Surprisingly over half of patients still continued to eat sweets and toffees during fixed appliance treatment. Although the majority of patients drank water, fizzy drinks were more likely to be consumed in-between meals rather than at meal times. The British Orthodontic Society advises that oral hygiene advice, oral hygiene instruction and use of fluoride supplements should be carried out by orthodontists in order to minimise the risks of dental decay. In this department, verbal dietary and oral hygiene advice is routinely provided at the start of treatment and the relevant information leaflets are also provided. The extent of reinforcement during treatment will depend upon the individual patient and treating clinician.

The audit standard for awareness of the aetiology of dental caries and the consequences of inappropriate dietary practice during fixed appliance treatment was not met. Patients did not appear to have a full understanding of what causes dental decay despite the information provided to them at the start of treatment. They were more likely to associate decay with a lack of tooth brushing rather than poor dietary habits. Additionally, patients were more likely to associate an inappropriate diet with fixed appliance breakages rather than with dental decay. Advice on how to avoid fixed appliance breakages may be repeated more frequently during treatment rather than advice on caries prevention, therefore it is also important for clinicians to also remind patients of the other consequences of inappropriate dietary practices.

The majority of patients felt that they have been provided with adequate information on correct dietary habits during fixed appliance treatment; however this was not reflected in their dietary habits and their knowledge of the consequences of inappropriate dietary habits, thus the audit standard was not met. With regards to patients being provided with sufficient information, the audit standard was not met at 78% but it was close to the 80% gold standard. Twenty-two percent of patients said they would have liked more information on what to eat and drink whilst wearing fixed appliances. A small number of patients suggested providing a written list of what food and drink to avoid whilst undergoing treatment. While it would be difficult to provide a comprehensive list of all foods and drinks to avoid, written guidance on avoiding certain types of foods and drinks (such as hard chewy foods and fizzy drinks) and advice on restricting non milk intrinsic sugars and acids to mealtimes would be beneficial in patient education. Patients may not have the ability to retain the initial verbal information provided and it is important to repeat this information during treatment in order to improve information retention. This includes educating both patients and parents and ensuring that they have read the relevant British Orthodontic Society information leaflets provided.
Questionnaire for patients wearing train-track braces

Please could you spend a few minutes of your time to fill in this questionnaire?
We are interested in finding out what you know about cleaning your teeth and what you eat whilst wearing a brace. This is so we can try and improve our patient care in the future.

**SECTION 1: ABOUT YOU**

a. Are you?
   - [ ] Male
   - [ ] Female

b. How old are you?


**SECTION 2: EATING AND DRINKING**

a. What do you think causes tooth decay? *(TICK AS MANY THAT YOU NEED TO)*
   - [ ] Plaque/food build up
   - [ ] It happens over time anyway
   - [ ] Not cleaning teeth properly
   - [ ] Bugs / bacteria
   - [ ] Sugar
   - [ ] Other (please describe)

b. While wearing braces are there any foods you avoid eating? *(TICK AS MANY THAT YOU NEED TO)*
   - [ ] None
   - [ ] Crusty bread & pizza crusts
   - [ ] Chocolate
   - [ ] Hard fruits e.g. apples, pears
   - [ ] Biscuits
   - [ ] Hard or chewy dried fruits e.g. dried bananas, dried mango

Thank you for filling this in!
<table>
<thead>
<tr>
<th>Sweets e.g. boiled or chewy sweets</th>
<th>Hard raw vegetables e.g. carrot sticks, celery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toffee</td>
<td>Nuts</td>
</tr>
<tr>
<td>Popcorn</td>
<td>Cereal bars</td>
</tr>
<tr>
<td>Crackers</td>
<td>Crunchy cereal e.g. Clusters</td>
</tr>
<tr>
<td>Crisps</td>
<td>Meat on the bone e.g. chicken drumstick</td>
</tr>
</tbody>
</table>

Other (please describe)...

---

c. What do you usually drink in-between meals while wearing braces? *(TICK AS MANY THAT YOU NEED TO)*

<table>
<thead>
<tr>
<th>Water</th>
<th>Fresh fruit juice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavoured water</td>
<td>Tea or coffee with sugar</td>
</tr>
<tr>
<td>Fruit squash</td>
<td>Tea or coffee without sugar</td>
</tr>
<tr>
<td>Fizzy drinks (e.g. Coke, Lucozade, lemonade)</td>
<td>Milk</td>
</tr>
<tr>
<td>Flavoured milkshakes</td>
<td>Other</td>
</tr>
</tbody>
</table>

---

d. What do you usually drink at meal times while wearing braces? *(TICK AS MANY THAT YOU NEED TO)*

<table>
<thead>
<tr>
<th>Water</th>
<th>Fresh fruit juice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavoured water</td>
<td>Tea or coffee with sugar</td>
</tr>
<tr>
<td>Fruit squash</td>
<td>Tea or coffee without sugar</td>
</tr>
<tr>
<td>Fizzy drinks (Coke, Lucozade, lemonade)</td>
<td>Milk</td>
</tr>
<tr>
<td>Flavoured milkshakes</td>
<td>Other</td>
</tr>
</tbody>
</table>

---

e. What happens if you eat or drink the wrong things while wearing a brace? *(TICK AS MANY THAT YOU NEED TO)*

<table>
<thead>
<tr>
<th>Nothing</th>
<th>Damage the teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stain the teeth</td>
<td>Make bad bugs/bacteria in the mouth</td>
</tr>
<tr>
<td>Scar the teeth</td>
<td>Break or damage the brace</td>
</tr>
<tr>
<td>Cause tooth decay</td>
<td>Make brace treatment take longer</td>
</tr>
<tr>
<td>Wear away the teeth</td>
<td>Braces have to be taken off before teeth have been fully straightened</td>
</tr>
<tr>
<td>Other (Please describe)</td>
<td></td>
</tr>
</tbody>
</table>

---

f. Do you think you have been given enough information on eating and drinking while wearing a train-track brace?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

---

g. How can we improve the information given to you about diet and what to eat and drink when wearing a train-track brace?  

---

Please return this questionnaire to your orthodontist, reception or you can post it back to:  

Miss S Stephens, Orthodontic department, Eastman Dental Hospital, 256 Grays Inn road WC1X 8LD
INTRODUCTION
Orthodontic fixed appliances can encourage the accumulation of plaque and bacteria and therefore a high standard of oral health is important. Poor oral hygiene during fixed appliance treatment increases the risk of dental caries and periodontal disease and may necessitate discontinuation of treatment. Therefore, it is essential that the orthodontic team provides oral hygiene instruction and guidance and should ensure that patients are able to demonstrate appropriate levels of oral hygiene before treatment commences. Research has shown that two thirds of orthodontic patients would like to know how fixed appliance treatment may affect toothbrushing. As the majority of orthodontic patients are adolescents, providing information to both patient and parents can play a key role in maintaining oral health. Lees and Rock (2000) compared the effectiveness of written information, a one to one session with a hygienist, and a videotape of oral hygiene instruction for patients who were being treated with fixed appliances and found no significant difference between three methods, indicating that no single method suits all learners.

AIMS
The aims of this audit were to:
1. To assess patient oral hygiene practices whilst undergoing fixed appliance treatment.
2. To assess patient knowledge of the importance of oral hygiene whilst undergoing fixed appliance treatment.
3. To identify areas for which information provision could be improved.

DESIGN AND SETTING
This was a prospective questionnaire-based audit carried out over a two week period in January 2012 in a postgraduate teaching hospital.

STANDARD
There were no set standards available in the literature. The audit standards were set by the authors following discussions at a departmental audit meeting prior to data collection:
• 100% of patients should carry out suitable oral hygiene practice.
• 100% of patients should be aware of the consequences of inappropriate oral hygiene practices whilst wearing a fixed appliance.
• 80% of patients should feel they have been provided with sufficient information about oral hygiene practices whilst wearing a brace.

METHOD
A questionnaire (appendix 1) on patient oral hygiene measure was developed by the audit team. There were 8 questions in total which were divided into three sections which included;
1. Patient demographics; age and gender.
2. Dental appointments; how often patients see their general dental practitioner for routine check-up appointments. This section also asked if patients had seen a hygienist for oral hygiene advice and, if so, when during orthodontic treatment this occurred.
3. Cleaning teeth. This section asked patients how often they brushed their teeth and what they used to clean their teeth. The last part of this section also asked patients what they thought would happen if they did not carry out the correct oral hygiene measures.

RESULTS
Sixty consecutive patients attending orthodontic appointments for fixed appliance adjustment with orthodontic registrars/postgraduate students, over a two day period were asked to complete a questionnaire. Patients included in the audit were those undergoing active orthodontic treatment with fixed appliances for orthodontic or orthognathic treatment. There was no age restriction and both adults and children/adolescents were asked to complete the questionnaire. Patients excluded from the audit were those who had not yet commenced orthodontic treatment, those in retention, those attending review appointments and those undergoing removable appliance treatment only.

Patients were asked to complete the questionnaire at the end of their appointment. The questionnaire was then returned by the patient to a data collection box at the reception desk in order to maintain confidentiality and anonymity.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>12-14 years</th>
<th>15-18 years</th>
<th>19-25 years</th>
<th>26 + years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>30</td>
<td>42</td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 1. Response to question: How old are you?

<table>
<thead>
<tr>
<th>Attendance for GDP check-ups</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 3 months</td>
<td>4%</td>
</tr>
<tr>
<td>Every 6 months</td>
<td>46%</td>
</tr>
<tr>
<td>Once a year</td>
<td>6%</td>
</tr>
<tr>
<td>When my orthodontist tells me to go</td>
<td>16%</td>
</tr>
<tr>
<td>I don’t need to go</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>6%</td>
</tr>
<tr>
<td>I do not have a GDP</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table 2: Response to question: How often do you see your GDP for check-ups?

<table>
<thead>
<tr>
<th>Seen a hygienist</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>64%</td>
</tr>
<tr>
<td>No</td>
<td>36%</td>
</tr>
</tbody>
</table>

Table 3: Response to question: Have you seen a hygienist for tooth brushing advice?
Table 4: Response to question: If you have seen a hygienist when was this?

<table>
<thead>
<tr>
<th>Frequency of tooth brushing</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice a day</td>
<td>80%</td>
</tr>
<tr>
<td>Once a day</td>
<td>8%</td>
</tr>
<tr>
<td>Every 2-3 days</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
</tr>
</tbody>
</table>

Table 5: Response to question: How often do you brush your teeth?

<table>
<thead>
<tr>
<th>Oral hygiene measure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal toothbrush</td>
<td>74%</td>
</tr>
<tr>
<td>Electric or battery toothbrush</td>
<td>24%</td>
</tr>
<tr>
<td>Inter-dental brush</td>
<td>26%</td>
</tr>
<tr>
<td>Single tufted brush</td>
<td>10%</td>
</tr>
<tr>
<td>Mouthwash</td>
<td>36%</td>
</tr>
<tr>
<td>Fluoridated mouthwash</td>
<td>16%</td>
</tr>
<tr>
<td>Dental floss/tape</td>
<td>8%</td>
</tr>
<tr>
<td>Disclosing tablets</td>
<td>8%</td>
</tr>
<tr>
<td>Toothpick</td>
<td>6%</td>
</tr>
<tr>
<td>Super floss</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
</tr>
<tr>
<td>African tooth stick</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 6: Response to question: What do you usually use to clean your teeth whilst wearing train track braces?

<table>
<thead>
<tr>
<th>Consequence of poor oral hygiene</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tooth decay</td>
<td>86%</td>
</tr>
<tr>
<td>Bad breath</td>
<td>76%</td>
</tr>
<tr>
<td>Dirty brace</td>
<td>76%</td>
</tr>
<tr>
<td>Stained teeth</td>
<td>68%</td>
</tr>
<tr>
<td>Swollen gums that bleed</td>
<td>68%</td>
</tr>
<tr>
<td>Mark on teeth</td>
<td>60%</td>
</tr>
<tr>
<td>Build up of bad bugs</td>
<td>36%</td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
</tr>
<tr>
<td>Nothing</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table 7: Response to question: What do you think happens if you do not clean your teeth properly?

<table>
<thead>
<tr>
<th>Correct amount of information on tooth brushing</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>88%</td>
</tr>
<tr>
<td>No</td>
<td>12%</td>
</tr>
</tbody>
</table>

Table 8: Response to question: Do you feel you have been given enough information on how to clean your teeth whilst wearing a train track brace?

The last question gave patients the opportunity to make any additional comments. Only three patients made comments and this included:
- “Provide information on websites to visit”
- “Provide information leaflets on what cleaning products to use”
- “Give me a leaflet”

DISCUSSION

The results showed that not all patients see a general dental practitioner for regular check-ups despite nearly all patients being referred to the department by a general dentist or orthodontic specialist. Patients are required to be registered with a general dental practitioner before embarking upon treatment within the department. Therefore, orthodontists need to ensure that all patients remain registered with a general dental practitioner and encourage their patients to attend for routine dental care whilst undergoing orthodontic treatment. The level of plaque accumulation, gingival health and presence and sign of decalcification should be recorded prior to commencing orthodontic treatment and also during treatment. If the level of oral hygiene or oral hygiene practice is inadequate this should be communicated to the patients, the patient’s parent (if under 16 years of age) and the patient’s general dental practitioner.

With regard to suitable oral hygiene practice, the audit standard was not met because only eighty percent of patients brushed their teeth at least twice a day and only a third carried out inter-dental cleaning. Patients should be encouraged to brush their teeth at least twice a day and use inter-dental brushes dipped in fluoridated toothpaste to obtain high approximal fluoride concentration. Over a third of patients used a mouthwash but only sixteen percent reported using a fluoridated mouthwash. The use of a fluoridated mouthwash may significantly reduce white spot lesions during orthodontic treatment therefore it is beneficial to incorporate this as part of a routine oral hygiene regime.

Not all patients were aware of the consequences of inappropriate oral hygiene practices. Patients were more likely to associate bad breath with poor oral hygiene rather than periodontal disease or white spot lesions. Therefore, continued effective oral hygiene practice advice and reminders of the consequence of poor oral hygiene should be reinforced during orthodontic treatment. Referring practitioners should be advised to refer well motivated patients with good oral hygiene during orthodontic treatment. Referring practitioners should be advised to refer well motivated patients with good oral hygiene for new patient appointments.

The majority of patients felt that they had been provided with sufficient information about oral hygiene practice during fixed appliance treatment; and the audit standard was met for this aspect, however twelve percent of patients felt they had not been given the correct amount of information and a small number of patients requested more written information on oral hygiene practice. Ideally all patients should feel they have been provided with appropriate information. In this department, oral hygiene instruction is supplemented with the appropriate information leaflets at the start of treatment. The extent of oral hygiene reinforcement during treatment will depend upon the individual patient. In order to enhance the effectiveness of this information clinicians should ensure that patients have received the information by more than one method. Clinicians should provide verbal instruction, ensure patients have read the relevant British Orthodontic Society information leaflets and also educate parents. Study models to demonstrate oral hygiene practice and clinical photographs to demonstrate the consequence of poor oral hygiene could be employed to educate patients and parents. Patients should be referred to the School of Hygiene and Therapy at the Eastman Dental Hospital for additional support if required.
RECOMMENDATIONS
1. Ensure all patients are registered with a GDP before starting treatment and reinforce the importance of regular check-ups.
2. Orthodontists should;
   a. Continue to provide verbal reinforcement of oral hygiene instruction during treatment and also reiterate the risks of poor oral hygiene.
   b. Demonstrate oral hygiene practice on study models to patients and parents.
   c. Use visual information such as clinical photographs to demonstrate the consequences of inadequate oral hygiene practice could be employed to educate patients.
   d. Ensure oral hygiene advice leaflets are easily accessible to patients and parents.
   e. Refer patients to the School of Hygiene and Therapy at the Eastman Dental Hospital for additional support if required.

REFERENCES

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**Questionnaire for patients wearing train-track braces**

Please could you spend a few minutes of your time to fill in this questionnaire?

We are interested in finding out what you know about cleaning your teeth and what you eat whilst wearing a brace. This is so we can try and improve our patient care in the future.

**SECTION 1: ABOUT YOU**

a. Are you?
   - □ Male
   - □ Female

b. How old are you?
   - ..................

**SECTION 2: DENTAL APPOINTMENTS**

a. How often do you see your general dental practitioner (own dentist)? (TICK ONE BOX ONLY)
   - □ I don’t need to go anymore because I am seen here
   - □ When my orthodontist tells me to go
   - □ I don’t have one
   - □ Every 2 years
   - □ Once a year
   - □ Every 6 months
   - □ Every 3 months
   - □ Other (tell us how often).................................

b. Have you seen a hygienist for tooth brushing (TICK ONE BOX ONLY)
   - □ Yes
   - □ No

c. If yes when did you see the hygienist? (TICK ONE BOX ONLY)
   - □ Before I had my braces put on
   - □ After I had my braces put on
   - □ Both before & after I had my braces put on
SECTION 3: CLEANING YOUR TEETH

a. How often do you usually brush your teeth? **(TICK ONE BOX ONLY)**

- [ ] Once a day  
- [ ] Twice a day  
- [ ] Once every 2 or 3 days  
- [ ] Less than once every 2 or 3 days  
- [ ] Other (please describe) ………………………………………………………………………………………

b. Do you usually brush your teeth before you see your orthodontist? **(TICK ONE BOX ONLY)**

- [ ] Yes  
- [ ] No  

---

c. What do you usually use to clean your teeth? **(TICK AS MANY OPTIONS AS YOU NEED TO)**

- [ ] Toothbrush  
- [ ] Electric or battery toothbrush  
- [ ] African tooth stick  
- [ ] Single tufted brush  
- [ ] Interdental (TePe) brush  
- [ ] Dental floss/tape  
- [ ] Toothpick  
- [ ] Disclosing tablets  
- [ ] Mouthwash  
- [ ] Fluoride mouth wash  
- [ ] Other (please describe) ……………………………………………………………………………………………………

---

d. What do you think happens if you do not clean your teeth properly? **(TICK AS MANY OPTIONS AS YOU NEED TO)**

- [ ] Nothing  
- [ ] Build up of bad bugs  
- [ ] Bad breath  
- [ ] Swollen gums  
- [ ] Stained teeth  
- [ ] Bleeding gums  
- [ ] Marks on the teeth  
- [ ] Gum disease  
- [ ] Decay/rotting teeth  
- [ ] Damage to teeth and gums  
- [ ] Dirty brace  
- [ ] Other (please describe) ……………………………………………………………………………………………………

---

e. Do you feel you have been given enough information on how to clean your teeth whilst wearing a brace? **(TICK ONE BOX ONLY)**

- [ ] Yes  
- [ ] No  

Thank you for filling this in!

Please return this questionnaire to your **orthodontist, reception** or you can post it back to:  
Miss Rachel Stephens, Orthodontic department, Eastman Dental Hospital, 256 Grays Inn road WC1X 8LD
INTRODUCTION
Study models within orthodontics serve to aid diagnosis and treatment planning1. Dental plaster casts have been considered the ‘gold standard’ due to their versatility, in ease of production, measurement recording, and ability to be articulated2. Through the course of treatment study models are reference tools for assessing progress of treatment, e.g. arch form, arch width and inter-canine width. Study models aid learning and teaching, for registrars, therapists but also for peer review, and are a required part of compulsory assessments in orthodontic primary care contracts3. Study models are also requirements for examination purposes at MOrth, It is a medico-legal requirement that study models are retained until patients reach the age of 25 for children or 8 years for adults4. The retention of study models as patient records necessitates they are retained in their original form, without fractures or breaks. If models (study or working models) are not maintained there is a loss of clinical time chair side as well as a cost implication in their repair. Model boxes have the potential to harbour infective microorganisms due to their constituents being mainly cardboard and foam4. It is essential only items free of potentially harmful microorganisms be kept within model boxes. Departmental policy from cross infection policy permits the retention of cold disinfected wax bites, foam and laboratory ticket within the model box, but no other items.

AIMS AND OBJECTIVES
The aims and objectives of this audit were to:
• Assess safety and storage of patient model boxes
• Provide information on contents of model boxes at the University Dental Hospital Manchester
• Compare results to cycle 1 (2007)

STANDARDS
Currently no model box standards exist, the standards were derived from departmental policy (relating to model box labelling only) and experienced consultants. The results from the 2007 audit (cycle 1) were used as standards for two outcomes (correct packaging and model boxed containing no inappropriate items). Local cross infection policy permits the retention of cold disinfected wax bites, foam and laboratory ticket within the model box, but no other items.

1. Correct labelling of model box, according to departmental policy:
   A. Patient details present on model box (full surname and first name)
   B. Hospital number
   C. Consultant number
   D. Consultant colour
   E. Year of initial models
   F. Clinician name
   G. Sticker indicating active (yellow), review (red) or discharged (blue) patient
2. Correct packaging of models, defined as: foam present with dentition facing the foam and study models in chronological order
3. Initial study models
4. Last working model only (if applicable)
5. No sharp objects within the model boxes
6. Laboratory ticket present
7. Cold sterilised wax bite
8. No other items

METHOD
We identified 10 model boxes per clinician (consultants, FTTAs, specialty doctors, StRs, post-graduate students and orthodontic therapists), which were assessed for compliance to the standards from the model box storage rooms at UDHM. All current clinicians’ were assessed in this audit. This provided a total of 220 model boxes. A data collection sheet was piloted on 10 model boxes, adapted as necessary and used to collect the data for each of the 220 model boxes assessed.

RESULTS
The majority of the clinicians in both cycles at UDMH are specialty registrars or postgraduate students at 59% in cycle 2 and 81% in cycle 1. Table 1 indicates the type of clinician for cycle 1 and 2.

<table>
<thead>
<tr>
<th>Clinician</th>
<th>Cycle 1</th>
<th>Cycle 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>StR/PG</td>
<td>81%</td>
<td>59%</td>
</tr>
<tr>
<td>Consultant</td>
<td>13%</td>
<td>18%</td>
</tr>
<tr>
<td>FTTA</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Therapist</td>
<td>0%</td>
<td>9%</td>
</tr>
<tr>
<td>Specialty Doctor</td>
<td>0%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 1: Type of Clinician in audit cycles 1 and 2

Standard 1 Labelling of Model boxes
Only 17% of model boxes were labelled correctly in cycle 2, 100% of models were labelled correct in cycle 1, the details are presented in figure 1. 56% of model boxes had all the patient details present on the model boxes. The most common reason for incorrect labelling of patient details was the abbreviation of the patient’s first name (81%). The majority of model boxes had patient’s hospital number (98%). 44% of model boxes contained the consultant’s number. Only 34% of model boxes had the year of the initial model present. Nearly all model boxes had the clinician’s name present at 99%. 58% of model boxes had a sticker present indicating active, review or discharged patient. The model box colour was correct for only 34% on the model boxes.

![Figure 1: Missing details of model boxes](image)

Figure 1: Missing details of model boxes

Standards 2 – 8 model box contents
83% of model boxes in cycle 2 were packaged correctly; this was lower than cycle 1 at 92.5%. The most common reasons for packaging not being correct in cycle 2 was no foam being present in the model boxes and the teeth not facing the foam.

98% of initial study models were present in the model boxes. 80% of model boxes contained the last working model only. 20% of model boxes contained other working models as well as the lost working model. As a total 40% of model boxes did not have a working model.

...
8% of the model boxes contained sharps in cycle 2, the most common sharp was arch wires. Other sharps that were present were URAs and an expansion screw key.

72% of lab tickets were present in model boxes in cycle 2.

44% of model boxes contained wax bites in cycle 2.

The most common ‘other item’ was the laboratory prescription, with 2% of model boxes containing them. Other items within the boxes were overfilled models, models on top of foam, special trays, clear bags, elastic bands, patient instruction sheets, post it notes and occlusion wax bites.

In cycle 2 16% of model boxes contained inappropriate items (including sharps), this is significantly less then cycle 1, in which it was found 92.5% of model boxes contained inappropriate items.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Compliance Audit cycle 1</th>
<th>Compliance Audit cycle 2</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Correct labelling of model box</td>
<td>100%</td>
<td>17%</td>
<td>↓</td>
</tr>
<tr>
<td>2. Correct packaging of models</td>
<td>92.5%</td>
<td>83%</td>
<td>↓</td>
</tr>
<tr>
<td>3. Initial study models present</td>
<td>-</td>
<td>98%</td>
<td>↑</td>
</tr>
<tr>
<td>4. Last working model (if applicable)</td>
<td>-</td>
<td>80%</td>
<td>↓</td>
</tr>
<tr>
<td>5. No sharp objects within the model boxes</td>
<td>-</td>
<td>92%</td>
<td>↑</td>
</tr>
<tr>
<td>6. Laboratory ticket present</td>
<td>-</td>
<td>72%</td>
<td>↓</td>
</tr>
<tr>
<td>7. Cold sterilised wax bite</td>
<td>-</td>
<td>44%</td>
<td>↓</td>
</tr>
<tr>
<td>8. No Inappropriate items (including sharps)</td>
<td>7.5%</td>
<td>84%</td>
<td>↑</td>
</tr>
</tbody>
</table>

Table 2: Results summary for audit cycle 2 and cycle 1

DISCUSSION

The clinician type from cycle 1 to cycle 2 is broadly the same, however in cycle 2 a specialty doctor and two therapists have been introduced.

The results of this audit cycle fall significantly short of the agreed target of 100% except for standard 3 regarding whether initial study models were present.

Only 17% of model boxes were labelled correctly in cycle 2, 100% of models were labelled correct in cycle 1. This could be due to the change in departmental policy regarding labelling, requiring greater information. New required details such as consultant information and stickers (indicating activity) were the most neglected details.

Packaging of model boxes was compliant to a slightly lower order than in cycle 1 (cycle 1-92%, cycle 2-83%). The main cause was absence of foam and teeth not facing the foam. Both of these errors in packaging model boxes can result in damage to models and affect clinicians’ use of the models. Packaging of models relates to the initial packaging but also clinicians’ and members of staff’s use of the model box and repackaging. Errors can occur at both points. Only one model box contained models out of chronological order, this suggests a very high compliance to ordering models in chronological order.

Initial study models were present in most model boxes (98%). However in 5 model boxes no study models were present, they contained only working models, this maybe due to the study models being in another box, or no study models having been taken. The last working models were present in 60%, of which the relevant last working model was present in 80% of model boxes. 20% of the model boxes contained an extra working model. Historic working models are redundant and should be disposed of upon the fabrication of a new working model.

Laboratory tickets were present in 72% of model boxes. They contain patient details which facilitate the formation of the initial model box. Wax bites were present in only 44% of model boxes, retention of wax bites allows the models in static occlusion to be checked for accuracy and can facilitate the fabrication of duplicate models.

Sharps were present in 8% of model boxes. The most common cause was retention of arch wires (5% of model boxes). Arch wires should be disposed of after use and if required again new wires should be sought. Expansion screw keys and URA appliances were present in around 1% of model boxes. Expansion screws are used as part of removable or functional appliances, however should be given to the patient and not stored in the model box. URAs should be disposed of as sharps after their completion and not retained.

The most common other item was the laboratory prescription at 4%. Departmental policy requires laboratory prescriptions to be stored in the patient’s clinical notes. Clear bags and post-it notes were kept in around 1% of model boxes. Other items should not be kept in model boxes as they add disorganisation and clutter.

A previous re-audit showed 100% compliance to model box content standards at Birmingham Dental Hospital and Solihull Hospital. Standards were based on: no removal appliances, no exposed archwires (permitting sealed archwires), last working model only and laboratory prescriptions. Comparatively this re-audit at UDMH achieved 74% compliance, with more than one last working model the greatest non-compliance to the standard. The re-audit found production of written guidelines an effective method of improving compliance (93% cycle 1 – 100% cycle 2).

Another published re-audit from 2010 showed 2 cycles of model box content audit from Dundee Dental Hospital. Standards were: last working model only, no removal appliances, no miscellaneous items, no archwires, no wax bites, no laboratory prescriptions. The compliance achieved from the re-audit at Dundee Dental Hospital was 65%, non compliance was attributed to the retention of laboratory prescriptions and wax bites. Comparatively the re-audit at UDMH achieved 54% compliance, however the standards at UDHM considered the retention of a wax bite instead of its absence being a standard. Interestingly the authors considered items specific to risk infection (archwires, removal appliances or any other item deemed to carry an infection risk). Reduction in infection risk from cycle 1 (53.4%) to cycle 2 (1.2%) was 52.2%, the authors attribute this reduction to departmental guidelines.

CONCLUSION

The key conclusions which can be drawn from this re-audit are:

- None of the standards meet the 100% compliance target.
- Current overall departmental compliance with the correct labelling of study models is poor, at 17%.
- Sharp objects were found in 8% of model boxes, which could compromise clinician safety.
- Inappropriate items were found in 16% of model boxes, which is a significant improvement from cycle 1.
- Further education of the team is required to improve compliance, and implementation of any recommendations must be ensured.
AN AUDIT OF INSTRUMENT DECONTAMINATION STANDARDS AND BARCODE STICKER USAGE IN A LONDON TEACHING HOSPITAL ORTHODONTIC DEPARTMENT

L. Tabrett, H. Ling and P. Acharya. Eastman Dental Hospital, London

INTRODUCTION
Decontamination can be defined as ‘the combination of processes used to make reusable instruments safe for further use on patients and for handling by staff’. In 2003, the National Decontamination Strategy for Modernising the Provision of Decontamination Services (2003) proposed a set of standards for all NHS facilities at every stage of the decontamination cycle, including the provision of decontamination areas away from the clinical environment and instrument tracking systems. Following the launch of the National Decontamination Strategy, decontamination of reusable instruments within the Eastman Dental Hospital (EDH) was centralised to the Central Sterile Service Department (CSSD). The decontamination and use of instruments is tracked throughout the decontamination cycle, including the use of stickers in patient records.

AIMS
The aim of the present audit was to assess compliance with the National Decontamination Strategy. Our specific aims were:

- To ensure the preparation of instrument trays was in line with recommended professional standards.
- To assess the usage of barcode stickers within patient records in the orthodontic department for instrument tracking purposes.

STANDARDS
In a previous cycle of this audit within the orthodontic department at the EDH, a gold standard of 85% was set. However, in accordance with a similar audit in the literature we agreed upon a gold standard of 100%. Consequently, 100% of instrument trays should be correctly prepared and 100% of patient records should have an appropriately located sticker tracking instrument use.

MATERIALS AND METHODS
Part 1: Quality of Instrument Trays
This was a prospective audit of all instrument trays used in the orthodontic department over a three week period in February 2013. A tick-box style data collection form was designed and completed by the clinician or nurse at the time of tray usage. Details recorded included the completeness of the tray and the cleanliness and quality of the instruments. Cleanliness was assessed in terms of visible contaminants, including adhesive, debris and retained elastomeric modules. Instrument quality was assessed in terms of fitness for purpose.

Part 2: Use of Barcode Stickers
The second part of the audit was a retrospective assessment of 151 sets of notes with entries made in the orthodontic department. A data collection sheet was used to collect details of the grade of the clinician, the procedure carried out and the presence of an appropriately located sticker tracking the use of instruments during that treatment session. An equal spread of notes for all grades of clinician was assessed, with notes being sampled from those pulled for patients to be treated consecutively by each clinician during a one week period of data collection. The results were analysed anonymously.

RESULTS
Quality of Instrument Trays
During the three week audit period, 341 instrument trays were recorded including 224 fixed appliance trays (71%) and 53 removable appliance trays (17%). Overall, the 100% gold standard was not achieved as 81% of instrument trays were of a satisfactory standard. 169 fixed appliance trays (75%) and 49 removable appliance trays (92%) were satisfactory. 100% of bond-up (n=27) and debond trays (n=10) audited were satisfactory. The reasons for unsatisfactory fixed and removable trays are displayed in Figure 1. The majority of ‘dirty’ fixed appliance instruments were due to a retained elastomeric module in the mosquito forceps (n=4, 66% of all ‘dirty’ fixed appliance instruments). In other cases, no reason was given and this could have been due to the same reason, or rust associated with inadequate oiling of the instruments.

Figure 1. The reasons for 55 unsatisfactory fixed appliance and 4 unsatisfactory removable appliance trays.

REFERENCES
After trays containing one or more defective instrument(s) had been discounted, 89% of all instrument trays were deemed of satisfactory standard. 24 fixed trays (11%) had a defective instrument. Mosquito forceps were the most frequently recorded faulty instrument (5% of all fixed trays).

Use of Barcode Stickers
Of the 151 sets of notes sampled, 54% (n=82) had an appropriately located sticker tracking the instruments used during the last treatment session in the orthodontic department. The 100% gold standard was not achieved by any grade of clinician (see Figure 2). Stickers were used appropriately for 54% of fixed appliance adjustment (n=59) and 77% of removable appliance adjustment procedures (n=13).

DISCUSSION
The results of this audit have highlighted two areas for improvement within the decontamination process at the EDH. 81% of the 314 instrument trays used in the orthodontic department were satisfactory and 54% of the 151 patient notes samples had an appropriately located sticker tracking instrument usage. Thus, the 100% gold standard was not achieved for either part of the audit.

Quality of Instrument Trays
Although the 100% gold standard was not achieved in the current audit cycle, comparison with previous cycles suggested improvements have been made. During a previous cycle conducted in 2010, 66% of 352 instrument trays audited during a three week period were satisfactory compared with 81% of 314 trays in the present cycle. Moreover, 89% of instrument trays were deemed satisfactory once those containing a defective or faulty instrument had been discounted. The cost of replacing all faulty instruments may not be feasible in the current economic climate. However, there are a number of changes in practice that would improve our compliance with the National Decontamination Strategy for Modernising the Provision of Decontamination Services without compromising patient care. In addition, the 314 trays assessed during our audit cycle only represented 32% of the total number of trays returned to CSSD from the orthodontic department during the week audit period (972 trays).

Use of Barcode Stickers
The tracking of instruments was one of the key measures proposed in the National Decontamination Strategy for Modernising the Provision of Decontamination Services. In the present cycle, only 54% of orthodontic patient records had an appropriately located sticker tracking the use of instruments. This finding was likely to be the result of non-compliance with infection control protocols and also the ongoing problem of non-adhesive stickers being lost from the notes when they are opened and used.

The following recommendations have been made:
• Clinical staff should work together to ensure the appropriate use of stickers. Although nursing staff play an important role in removing stickers from instruments wrapping, the overall responsibility for placing stickers in notes remains with the treating clinician.
• Liaise with CSSD staff regarding quality of adhesiveness of barcode stickers.
• Re-audit in 2 years.

CONCLUSION
A 100% standard of compliance relating to instrument processing and tracking was not achieved in the present audit cycle. Regular re-audit of our centralised decontamination system is essential to ensure compliance with the National Decontamination Strategy and optimise the quality of patient care.

ACKNOWLEDGEMENTS
The authors would like to thank all clinical staff in the orthodontic department at the EDH for their co-operation during data collection.

REFERENCES
INTRODUCTION
The overall prevalence of demineralisation amongst orthodontic patients has been reported as anywhere between 2-96%\(^1\)-\(^4\). This can be a significant clinical problem due to the poor appearance of the teeth that results and the potential for cavitation necessitating restoration.

Overall management is primarily preventive due to the challenging nature of treating white spot lesions. Such measures include careful initial patient selection, regular reinforcement of the importance of good oral hygiene and diet, and the application of appropriate preventive medicaments, with good compliance being essential for success\(^5\).

Fluoride is important in the prevention of decalcification. Marinho found a definite reduction in caries in children and adolescents who regularly rinsed with a fluoride mouthwash\(^6\), whilst Geiger reported a 30% reduction in the incidence of decalcification when orthodontic patients used a fluoride mouthwash\(^7\).

A 2008 Cochrane review concluded that there was some evidence that regular rinsing with a fluoride mouthwash is effective at reducing the severity of white spots in orthodontic patients, and recommended daily rinsing with 0.05% NaF mouthwash\(^8\). Consequently, many orthodontists recommend the use of a daily fluoride mouthwash throughout treatment to prevent demineralisation.

A fluoride mouthwash is most effective if it is used regularly by the patient and therefore relies on patient compliance to succeed. There is evidence to suggest that compliance with mouth rinsing is poor. Geiger reported that only 42% of patients rinsed with a sodium fluoride mouthwash at least every other day, and those with the least compliance experienced greater decalcification\(^7\).

In line with these recommendations, a 100ml bottle of 2% NaF mouthwash used to be dispensed to all patients undergoing fixed appliance treatment, with instructions on dilution to 0.05%. A departmental audit in 2007 found that 91.7% of respondents claimed to use their fluoride mouthwash, with 76.7% claiming to use it daily. Only 67% of respondents felt that they were encouraged in its use by the orthodontic team and only 60% felt that they had received warnings about accidental overdose\(^9\).

Recommendations following this audit included:
1. Written and verbal information regarding fluoride mouthwash when fixed appliances are placed, including information about dosage, overdose and misuse
2. Encouragement at each appointment
3. Reinforcement regarding use and safety by nursing staff
4. Waiting room information on the use and safety of fluoride mouthwash

Unfortunately, the Trust’s pharmacy subsequently ceased dispensing fluoride mouthwash. Instead, patients are now advised to buy a proprietary 0.05% NaF mouthwash and are given verbal advice on its correct use.

AIMS
• To assess the proportion of patients using fluoride mouthwash
• To assess whether patients know how frequently they should use fluoride mouthwash
• To assess whether patients feel they have had appropriate advice and encouragement with regard to use

STANDARDS
• 100% are advised to use a daily fluoride mouthwash and are given appropriate instructions regarding use, including the recommended frequency
• 95% use a fluoride mouthwash
• 95% use it daily
• 95% receive additional encouragement by orthodontic staff

The 95% compliance targets were set following discussion with departmental Consultants and were considered achievable.

MATERIALS AND METHODS
The audit was commenced on 1st July 2013. All patients attending orthodontic appointments at St Luke’s Hospital, Bradford for fixed appliance treatment were invited to participate anonymously. Data was collected until 100 questionnaires had been completed.

Data was collected by a specially designed, anonymous questionnaire answered by way of a series of tick boxes. The 7 questions were designed to investigate the current use of, and level of knowledge regarding, fluoride mouthwash in patients undergoing fixed appliance treatment.

Patients were given the questionnaire to complete at the end of their treatment session and instructed to place the completed questionnaire in a tray at reception. To avoid patients completing more than one questionnaire, an identifying number was placed at the top of each questionnaire. Data from the 100 completed questionnaires was entered into SPSS version 20 for analysis.

RESULTS
100 questionnaires were analysed. Not every patient answered all the questions on the form, giving a response rate of between 93 and 100%.

Question 1: I was advised to use a fluoride mouthwash when my braces were fitted
83% of respondents agreed that they were advised to use a fluoride mouthwash when their braces were fitted, 5% disagreed, and 11% did not know (Chart 1).

**Chart 1: Proportion of respondents who recalled being advised to use a fluoride mouthwash when placement of their fixed appliances**

Question 2: I use a fluoride mouthwash
80% of respondents stated that they use a fluoride mouthwash, 18% did not, and 2% did not know (Chart 2).
Chart 2: Proportion of respondents who stated that they used a fluoride mouthwash

Question 3: I received instructions about how I should use the mouthwash

69% of respondents agreed that they had received instructions on the use of fluoride mouthwash, 13% disagreed, and 17% did not know (Chart 3).

Chart 3: Proportion of patients who recalled receiving instructions about fluoride mouthwash

Question 4: I use a fluoride mouthwash (frequency)

64% used a fluoride mouthwash at least once daily. 34% of respondents stated that they used a fluoride mouthwash twice daily, 30% used it once daily, 12% used it every other day, 14% less than every other day, and 8% did not know.

Question 5: I think I should use a fluoride mouthwash

55% of respondents stated that they thought that fluoride mouthwash should ideally be used twice daily. One explanation for this could be that these respondents were unaware of the correct protocol but were aware that they should brush their teeth twice daily, therefore incorrectly guessed that the mouth washing regime

68% of respondents stated that they received instructions about the use of fluoride mouthwash from the orthodontist, 5% from the nurse, and 10% from both the orthodontist and the nurse (83% in total received instruction). 16% stated that they had not received instructions (Chart 5).

Chart 5: Proportion of respondents who stated they received instructions from various members of the orthodontic staff

Question 7: I was encouraged to use a fluoride mouthwash by the orthodontic staff

76% of respondents agreed that they were encouraged to use a fluoride mouthwash by the orthodontic staff, with only 8% disagreeing (Chart 6).

Chart 6: Proportion of respondents who stated that they were encouraged to use a fluoride mouthwash

DISCUSSION

Disappointingly, none of the standards were met. When the audits in 2000 and 2007 were conducted patients were given a dilutable mouthrinse free of charge with dosage instructions printed on the bottle. This may have increased awareness of the importance of its use as well as making the fluoride mouthwash more accessible. Compared with these previous audits there has been a reduction in the proportion of patients who reported using a daily fluoride mouthwash. This was particularly evident since 2007. A possible explanation for this might be that, patients now need to seek and, perhaps more importantly, pay for the mouthrinse.

Disappointingly, despite 83% of respondents stating that they had been advised to use a fluoride mouthwash, only 64% of respondents actually used a fluoride mouthwash at least once a day. Previous studies have also identified compliance in self-administered fluoride programs to be a significant problem. Only 29% of respondents could accurately recall how often they should be using a mouthwash. 55% of respondents stated that they thought that fluoride mouthwash should ideally be used twice daily. One explanation for this could be that these respondents were unaware of the correct protocol but were aware that they should brush their teeth twice daily, therefore incorrectly guessed that the mouth washing regime
would be the same. A further, more concerning, explanation could be the consequence of conflicting advice. In line with the current best evidence a 0.05% NaF mouthwash is recommended by the Orthodontic Department for use once-daily, ideally at a different time to toothbrushing, to reduce the severity of white spots lesions. However, the instructions on several different brands of commercially available fluoride mouthwash advise twice-daily use, after brushing (Table 1). Only the recommendations/directions on the bottle of Colgate Fluoriguard mouthwash were in line with the current recommendations. As the Department does not currently provide written instruction regarding the use of fluoride mouthwash it is not surprising that patients may get confused.

<table>
<thead>
<tr>
<th>Mouthwash</th>
<th>Dosage</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquafresh Extra Care</td>
<td>250ppm Sodium Fluoride</td>
<td>10mls twice daily after brushing</td>
</tr>
<tr>
<td>Colgate Fluoriguard Daily Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>5-10mls once daily at a different time to brushing</td>
</tr>
<tr>
<td>Dentyl Active Intense</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>½ cap twice daily after brushing</td>
</tr>
<tr>
<td>Endekay Daily Fluoride Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>½ cap</td>
</tr>
<tr>
<td>Listerine Advanced Care</td>
<td>450ppm Sodium Fluoride</td>
<td>15mls twice daily after brushing or as directed by a dental professional</td>
</tr>
<tr>
<td>Listerine Teeth and Gum Defence</td>
<td>100ppm Sodium Fluoride</td>
<td>20mls twice daily after brushing</td>
</tr>
<tr>
<td>Listerine Total Care</td>
<td>100ppm Sodium Fluoride</td>
<td>20mls twice daily after brushing</td>
</tr>
<tr>
<td>Morrisons 6-in-1 Total Care Power Mint Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>½ cap twice daily after brushing</td>
</tr>
<tr>
<td>Morrisons Cool Mint Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>½ cap twice daily after brushing</td>
</tr>
<tr>
<td>Tesco Everyday Value Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>1 cap twice daily</td>
</tr>
<tr>
<td>Tesco Freshmint Mouthwash</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>1 cap throughout the day as required</td>
</tr>
<tr>
<td>Wisdom Fresh Effect</td>
<td>0.05% Sodium Fluoride 225ppm</td>
<td>1 cap twice daily after brushing</td>
</tr>
</tbody>
</table>

Table 1: Comparison of fluoride content and directions for use for different fluoride-containing mouthwashes

Depending on how the question was phrased, between 69-83% respondents stated that they had received instructions regarding the use of mouthwash. The accuracy of these results is reliant on patient memory and honesty and is a potential source of bias.

Although the orthodontist/therapist has the prime responsibility for giving information to the patient it was disappointing to find that only 15% patients recalled receiving information from the nursing staff (5% nurses alone, 10% from both). With regard to this sample, some patients might have attended a nurse-led clinic prior to the placement of fixed appliances. This is at the discretion of the orthodontist/therapist and may be a further source of bias.

CONCLUSIONS AND RECOMMENDATIONS
- Clear written instructions regarding the use and importance of fluoride mouthwash with graphic demonstration of good oral hygiene procedures and photographs of white spot lesions should be given to all patients when fixed appliances are placed in addition to the existing verbal advice.
- Re-instate nurse led clinics for all patients prior to treatment. Emphasis should be placed on the importance of daily fluoride mouthwash use at this clinic.
- Emphasis should be given to the patient throughout the duration of their treatment with regards to fluoride mouthwash use.
- Nursing staff should be encouraged to reinforce the information given by the orthodontist.

The recommendations will be implemented and re-audit within two years.

ACKNOWLEDGEMENTS
I would like to thank all the staff in the orthodontic department for their invaluable help in distributing the questionnaires.

REFERENCES
INTRODUCTION
Orthodontists routinely request that general practitioners extract one or more teeth as part of a patient’s overall orthodontic treatment plan. Often these teeth are caries free, in an otherwise healthy dentition, with very little restorative treatment having been carried out on the younger patients. These extractions are often a child’s first introduction to local anesthetic and can often cause high stress for the patients, parents and dentist alike.

In 2013 the DDU reported a three-fold increase in extraction error complaints from 2006 to 20111. In the past the quality of the orthodontist’s extraction letter has been scrutinized, not only as the source of the error, but also as the means by which errors can be prevented2. However, the most common error reported was that the dentist had misread the extraction letter3 and therefore it must be appreciated that mistakes resulting in erroneous extractions can occur at a number of stages along the process.

Locally this issue has been raised due to a number of incidents involving the extraction of the incorrect teeth. As a result of these incidents a letter was sent by the Consultant orthodontist in the area to all referring orthodontists and general dental practitioners, highlighting these errors and suggesting recommendations and standards to prevent them. The unfortunate implications of incorrect orthodontic extractions can be numerous but will often result in a compromised treatment plan and the possibility of litigation.

AIMS
This is a General Practice based audit to assess the compliance with the standards set out by our Consultant for orthodontic extraction letters received in my General Dental Practice (Table 1) and to identify areas of improvement to ensure appropriate extractions for orthodontic purposes.

METHOD
This was a prospective questionnaire-based audit carried out between January and October 2013 by two General Dental Practitioners (J.M. and J.H). Patients included in the audit were those undergoing active treatment with a number of local Orthodontists. There was no age restriction or exclusion criteria and the patients selected were those that were attending the practice for an orthodontic extraction only. The audit was carried out on a concurrent basis. We received orthodontic extraction requests for both adults and children though overwhelmingly the requests are for younger patients. A pro forma was drawn up with each of the six standards to be completed with either a Y for Yes or an N for No. The dentist filled out the pro forma at the time of the extractions. The date and the extractions carried out were noted on the pro forma with a box for free text comments, if the dentist felt appropriate.

RESULTS
40 pro forma sheets were completed with 54 teeth extracted

<table>
<thead>
<tr>
<th>Standards for orthodontic extractions</th>
<th>Number of Yes</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the letter requesting extraction available in advance of the extraction appointment?</td>
<td>38</td>
<td>95%</td>
</tr>
<tr>
<td>Was the notation of teeth to be extracted communicated by the orthodontist in two forms?</td>
<td>32</td>
<td>80%</td>
</tr>
<tr>
<td>Was the extraction pattern requested in typed form rather than written?</td>
<td>36</td>
<td>90%</td>
</tr>
<tr>
<td>Was the letter requesting extractions available chair-side at the time of extractions?</td>
<td>40</td>
<td>100%</td>
</tr>
<tr>
<td>Was a DCP available chair-side at the time of extraction to help identify the teeth to be extracted?</td>
<td>40</td>
<td>100%</td>
</tr>
<tr>
<td>Were the teeth noted on the letter struck through with a pen and dated after the extractions?</td>
<td>40</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 2. Results

DISCUSSION
The results of this audit fell short of the 100% compliance with the standards set. In such high risk extractions there is no margin for error. Overall the compliance with recommendations was 94%. We also have to highlight that as the practitioners we were also the subject and were “self-marking” ourselves for some of the audit. Given the prospective nature of the audit the results of that part of the audit may be skewed. The main problem highlighted however by this audit is that the tooth notation is not communicated in two forms in every letter, with 20% failing to meet this particular standard. The BOS Advice Sheet 12: “Orthodontic Extractions Risk Management Guidelines” recommends this as part of their overall gold standard for writing an orthodontic extraction letter. Completion of this audit has made it apparent that there is great variation between orthodontists (and even sometimes by the same orthodontist) as to how the information within extraction letters is presented. There must be uniformity in this regard in that the teeth to be extracted are noted in two forms, typed and in dental notation, especially as practitioners vary as to their preferred notation, commonly FDI or the Palmer Notation 4 in the UK. (Another way of notating commonly used is “UR4” or “LL5”.)

Another issue is the delay in the extraction letter being received at the practice. In this audit 5% were not available in advance of the extraction appointment. This led to increased administration for the practice to ensure all letters were available at the extraction appointment. It has been known for practitioners to phone the orthodontist, or more likely the receptionists, to convey the information so that the dentist can
continue to extract the tooth. There is so much that can go wrong in a case such as this. This situation could be improved by the use of digital correspondence between the practices, especially given that there can be delays in getting letters out of hospital departments and practices, and there are often increasingly delays with the postal service. Added to this is the pressure to use cheaper services in the NHS e.g second class post or even TNT instead of first class post.

Our practice policy is to not extract any tooth without the letter at chair-side. Patients have been refused extractions on this basis, hence the 100% compliance with this standard. When the standards were issued we made it practice policy to comply with the Consultant Orthodontist’s standards. Therefore a pleasing result is that we have complied in 100% of cases audited. In one of the letters requesting extractions, the orthodontist gave us a choice of tooth to extract depending on which tooth had the worst prognosis. Consideration must be given to the orthodontic treatment plan as this may alter very slightly depending on the tooth extracted. Such that if the second premolar was extracted the anchorage may need to be reinforced, however it may not should the first premolar be extracted. Further information would be beneficial in this case. In certain circumstances it may be prudent for the orthodontist to send a copy of an OPT if one has been taken. These can be scanned onto paper or sent electronically and can be of great help especially if a lower third molar has to be removed. One local orthodontist includes a scanned OPT with every letter requesting extraction and also highlights the teeth to be removed on the scanned copy along with two forms of notation.

CONCLUSIONS

Compliance in general is very high with regards to the standards that were drawn up, but our small audit identifies that there are gaps in the information being conveyed between orthodontists and GDPs. Tooth notation is not always conveyed in two forms and this should be standardized. Teeth should never be extracted without the written letter at the chair-side at the time of extraction.

We have found the standards very useful in our daily practice, especially annotating the extraction letter after extraction, a convenient method of communicating to other GDPs within the practice which extractions have been completed. This of course is only effective when GDPs comply with the standard requesting they have the extraction letter available at the time of extraction.

RECOMMENDATIONS

We have communicated our findings with our local consultant, who plans to re-draft a letter to all general practitioners and orthodontists. It will include an accompanying wall notice as an easy reminder to help ensure that these guidelines are strictly adhered to. We also recommend referring orthodontists share relevant radiographs and/or photographs, where possible to assist communication to GDPs. We plan to re-audit, and intend to invite neighbouring practices to participate, to give a more representative conclusion.

REFERENCES

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AN AUDIT ON PATIENT SATISFACTION AMONG LINGUAL ORTHODONTIC PATIENTS

R. Paul Cheruvathur, H. Patel. The Liverpool Brace Place, Liverpool

INTRODUCTION

Recent years have seen a marked rise in adult patients undergoing fixed orthodontic therapy and they are often less willing to accept conventional fixed orthodontic appliances. Most of these adult patients want to achieve their desired result without being shown in public that they are undergoing a fixed orthodontic treatment. Lingual braces play an important role in the armamentarium of specialist orthodontists in their pursuit to meet these challenging patient expectations. Lingual orthodontic appliances have markedly evolved over the past decade. In this audit we examine whether a lingual brace system –Incognito™, is meeting those expectations and is there anything we can do to further improve the patient satisfaction. We also examine the extent of other well-documented reasons of discomfort among lingual appliance patients including speech and eating difficulty in this group.

AIMS

1. The primary aim of the audit is to determine whether patients are satisfied with their choice of appliance.
2. Identify the patient characteristics and motivating factors for choosing the lingual brace.
3. To check whether those motivating factors/expectations are met by the choice of appliance.
4. To identify the common difficulties for patients during the treatment and the duration of those impairments.

STANDARD

There are no previously defined standards specifically for patient satisfaction with their choice of lingual appliance. Since all the suitable patients were given other appliance options and alternatives during initial assessment, including conventional metal braces, ceramic braces and Invisalign™, the overall patient satisfaction with the choice of lingual brace appliance was set as 100%.

METHOD

The setting of the audit is in a specialist referral orthodontic practice. The audit was conducted between 1 January 2013 and 31st December 2013. All patients who are undergoing or have completed fixed lingual appliance orthodontic treatment during 2012 and 2013 under the supervision of a single practitioner in a specialist orthodontic practice were given a questionnaire. Patients who had lingual braces for less than 4 months were excluded. Data was entered into a Microsoft Excel spreadsheet and the results analysed.
RESULTS
30 patients met the selection criteria and were included in the audit of which 20 (66.7%) were female and 10 (33.3%) were male.

The age distribution of the sample is shown in Figure 1. Although most patients where in 18-30 year age group (50%), you will notice nearly 23.33% (n=7) is above 40 age group.

Among all the patients in this audit, 36.7% (n=11) had previous history of orthodontic treatment.

Various options considered by patients before choosing a lingual brace were as follows: 70.0% (n=21) considered clear aligners, 20.0% (n=6) considered metal braces and 10.0% (n=3) considered ceramic braces.

Figure 1: Age distribution

Reasons for choosing lingual appliance are shown in Figure 2. 70.0% (n=21) chose lingual appliance because they did not want people to know they were wearing a brace. 13.3% (n=4) chose to get better results and 13.3% (n=4) chose because they were embarrassed to have ‘train track braces’. Interestingly only one patient (3.3%) has mentioned ‘no risk of decalcification of front surface’ as a single important factor in their decision to choose a lingual brace.

Figure 2: Reasons for choosing lingual brace treatment

The greatest single difficulty encountered during the treatment was reported as speech by 43.3% (n=13) of patients. This was followed by eating difficulty reported by 33.3 % (n=10), cleaning by 13.3% (n=4), irritation to gums reported by 6.7% (n=2) and 3.3% (n=1) patient reported pain from teeth. See Figure 3. Soreness on tongue was not mentioned in the questionnaire but was commented on by some patients.

Figure 3: Single most difficulty encountered during treatment

After fitting the lingual braces, the speech difficulty lasted 1-2 weeks for 46.7% (n=14) of patients. 40.0% (n=12) reported speech difficulty for 2-4 weeks and 10.0% (n=3) felt it for 4-8 weeks. Only 3.3% (n=1) reported speech difficulty lasted over 8 weeks as shown in Figure 4.

Figure 4: Duration of speech difficulty after appliance fit

We also looked into the comfort of lingual appliance in the first month and after the first month. (Rate of comfort =1 being least comfortable and 10 being most comfortable). In the first month after fitting lingual braces, 66.7% (n=20) patients rated comfort between 4-7, 16.7% (n=5) between 8-10 and 16.7% (n=5) rated between 1-3. After the first month, the rate of comfort improved with 66.7% rating between 8-10, 30% (n=9) rating between 4-7 and only 1 patient (3.3%) rated between 1-4.

83.3% (n=25) mentioned people ‘never’ identified them wearing lingual brace. 16.7% (n=5) mentioned people ‘rarely’ identified them wearing lingual brace as shown in Figure 5. None of them mentioned ‘often’ or ‘very often’.

Figure 5: How often others identify the lingual brace
Overall 86.7% (n=26) were 'very pleased' and 13.3% (n=4) were 'pleased' with the choice of appliance. No one mentioned 'ok' or 'unhappy'. 100% satisfaction achieved for choosing lingual appliance as their appliance of choice for fixed orthodontic therapy thereby meeting the audit standards.

90% (n=27) reported that they would recommend lingual appliance treatment to others considering fixed orthodontic therapy. 10% (n=3) were unsure and no one reported they would not recommend lingual appliance treatment.

DISCUSSION

The patient characteristics were predominantly female (66.7%) and 18-40 age group (70%). There were only two patients below 18 years. This could be because lingual appliance treatment is provided privately and patients below 18 years of age can receive free treatment under NHS funding if they are eligible. It could also be due to conventional 'train track braces' being more socially acceptable among teenagers.

The motivating factor is predominantly aesthetics with 83.3% either not wanting people to know they are wearing a brace or embarrassed to have 'train track braces'. Speech and eating difficulty constituted 76.6% of the single most difficult item encountered during treatment. We have not looked specifically into impact of 'soreness of tongue' in this audit. The audit findings are consistent with other retrospective surveys, which suggested that the patient’s discomfort with lingual brackets tends to disappear gradually within one month of starting treatment1-2. Speech was the most severe problem in patients treated with lingual appliances1. There are various published research on discomfort associated with lingual appliances but the results can vary based on type of brackets used, types of questions asked and assessment times3. Literature shows customised brackets (as used in this audit – Incognito™) with smaller dimensions result in significantly less impairment, thereby enhanced patient comfort in lingual orthodontics4. Fritz has reported 87% would recommend the lingual technique without reserve to relatives and friends2. This is consistent with our audit findings (90%).

CONCLUSIONS

100% of patients were very pleased or pleased with the choice of lingual brace. The set standard was met in this audit although we should explore ways to improve patient comfort during the first few weeks of treatment. The motivating factor is predominantly aesthetics with patients not wanting others to know they wear a brace. 83.3% were ‘never’ identified as wearing a lingual brace and 16.7% were ‘rarely’ identified as wearing a lingual brace.

The common difficulties identified include speech, eating and keeping appliances clean. Speech difficulty did not extend beyond 4 weeks for 86% of patients. This information can be used to tailor the advice to lingual appliance patients in future.

RECOMMENDATIONS

1. Detailed briefing of all patients on the possible duration and scope of potential difficulties the patient should expect should be undertaken prior to treatment being started with a fixed lingual appliance. This procedure will protect both the patient and orthodontist from unrealistic expectations or disappointments6.

2. Designing a leaflet with post-op instructions based on available evidence1,6-7,8-9 to improve expectations and comfort for lingual appliance patients.

3. Re audit in 12 months time after implementing the recommendations.

ACKNOWLEDGEMENTS

Many thanks to Joanne Gorton (practice manager) in collecting the questionnaire, and Orthodontic Therapists Kate, Samantha and Amy, The Liverpool Brace Place, Liverpool.

REFERENCES

Guidance for prospective authors

The CE Bulletin is a peer reviewed publication with referees drawn from the FTTA members of the TGG. The referees’ reports are fed back to authors and utilised by the editors to recommend amendments as well as decide upon inclusion.

1) Document submission
   • Articles are best by email attachment to the Editor of CEB.
   • A covering letter should accompany each submission stating the names and addresses of all authors.

2) Document format.
   Tables and graphs must be formatted accordingly.
   • Manuscripts texts will only be accepted in Word format.
   • A separate Excel spread sheet file is required for any included graphs and charts.

3) Headings template. Audit project submissions will be expected to broadly follow a format as follows:
   • TITLE. This should be a succinct and accurate reflection of the project.
   • INTRODUCTION. To include rationale or need to undertake the project.
   • AIMS. A clear list of the project aims.
   • STANDARD(S). Should be quoted if available.
   • PROCESS/MATERIALS & METHODS. A clear explanation of the audit process.
   • RESULTS. Text should avoid simply repeating findings shown by graphs/charts. Clarification or explanation can be given if necessary.
   • DISCUSSION. As appropriate.
   • CONCLUSION/PLAN. The authors’ plans for implementation of findings to change practice as necessary, or to audit further should be described.
   • Acknowledgements.
   • References. Authors (Year) Title in full. J standard abbrev Vol No: Pages.

4) Graphs and charts, if included should be in Excel and
   • Have a concise accompanying legend. E.g. Figure 1. Result of treatment
   • The legend should be included in the main text rather than in the figure itself and should be in bold.
   • For the purposes of publication, graphs should be limited to 2 to 3 per submission.
   • Their content should not be overly complex, and be quickly and easily understood.

5) Tables should also be in Word format and similar recommendations apply.
   • Have a concise accompanying legend. E.g. Table 1. Number of appliances.
   • Limited to 10 – 15 rows to fit comfortably on the page.

6) References. Authors are responsible for accuracy and appropriateness. Their format is all italicised, no bold required. References are not compulsory but should be used if appropriate. Any references must be numerically referenced from the text in superscript. e.g.¹