



The British Orthodontic Society Clinical Effectiveness Bulletin

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Chairman's remarks

Back to basics?

Welcome to the first issue of the BOS Clinical Effectiveness Bulletin for 2009. Hopefully, its arrival will coincide with the first signs of Spring. A second issue is planned for later on this year. As a result, readers will be glad to know that my "Chairman's remarks" will be proportionately briefer!

This latest edition has a "back to basics" feel about it with a number of local audits being carried out on the quality of the basic clinical records that we all routinely obtain from our patients – clinical notes, study models and photographs. Orthodontists like to pride themselves on the standards of their clinical records. Amongst the dental sub-specialities, we seem to have developed the reputation for good record keeping. However, as these various audits aptly demonstrate, perhaps we are not always as good as we think we are! On closer reflection, there is no room for complacency but always room for improvement.

The BOS national audit of orthodontic mini-screw "effectiveness" has been underway now for nine months and currently has over 100 clinicians registered on the database. My continuing appreciation goes to Prof. David Bearn (Dundee) for his close management of the data being collected. If you are planning to use any make of mini-screw as part of your clinical practice, then please register and submit your data on-line for this prospective audit via the Research & Audit section of the BOS website at:
www.bos.org.uk/researchaudit/auditforminiscrewsandtemporaryanchoragedevices/

The national list of calibrated PAR scorers on the BOS website continues to lengthen, albeit slowly. If you are interested in "advertising" your expertise to colleagues and Primary Care Trusts around the country, then please contact me for further details.

The various national clinical guidelines of orthodontic relevance have all been re-written and updated by teams of authors during 2008. They should be available for viewing and downloading from the College website in the very near future – see www.rcseng.ac.uk/fds/clinical_guidelines for further details.

My sincere thanks to all those colleagues involved in this voluntary role for collaborating so well together and producing such high quality documents.

Finally, congratulations to the three winners of the revamped BOS Audit Prize, which were awarded at the Brighton BOC, as well as to the expanding team behind the continuing success and popularity of this Bulletin.

David Morris (david.morris@leedsth.nhs.uk)
Chairman, BOS Clinical Standards Committee
March 2009

Editor's Cut

Well here we are with a spring in our step and spring just around the corner – we hope! If we have yet another summer like the last two, my wife has threatened to disown the garden!

At least we can be happy with another fine crop of articles for this edition. This incidentally is the first of two for 2009, and the first produced under the new BOS CE Bulletin editorial board. The new regional sub editors generously giving their time are

Liz Turbil – Scotland, Ireland and Wales

Jonathan Chapple – Northern England

Gavin Mack – South East England

Niki Atack – Midlands and South West England

Angus Pringle -TGG representative (Clinical Standards Committee)

The editing and production of the Bulletin is now a team based and this has already had a significant impact on the

quality and division of work that goes into this publication. The other new demanding but pleasant task for the editorial board is the selection of three winning articles from the Bulletin for the new BOS Audit prize, first announced at the last BOC.

As ever, the whole show is based on the hard work and enthusiasm of the authors.

Gavin Barry

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THE INCIDENCE OF SPORTING ACTIVITIES AMONG ORTHODONTIC PATIENTS AND MOUTHGUARD USE

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INTRODUCTION

The participation in sports carries the risk of sustaining some form of injury and can account for 10-39% of all dental injuries¹. There are many young orthodontic patients who participate in contact sports without benefiting from the protection of mouthguards. A blow to the appliance can lead to the loosening of brackets and bending of archwires as well as potential damage to dentoalveolar segments and soft tissues.

A contact sport can be defined as “sports in which players physically interact with each other, trying to prevent the opposing team or person from winning”². Sports such as rugby, boxing, martial arts, lacrosse and hockey were included into this category. However, other common activities young people participate in such as cycling and skateboarding could also result in dento-alveolar trauma and damage to fixed appliances. No previous audits of this nature had been previously performed at any of the participating units.

AIMS

- 1) To assess the incidence and types of sporting activity amongst orthodontic patients
- 2) To establish whether mouthguards were being worn by orthodontic patients for contact sports
- 3) To assess patient’s perceptions and attitudes towards the availability of mouthguards from their hospital orthodontic departments and the accompanying financial implications.

STANDARD

A gold standard of 100% was decided based upon the recommendation of Chadwick et al³ which states, “It is recommended that all orthodontic patients wearing fixed appliances and participating in contact sports should wear an appropriate sports mouthguard to protect against possible dangers.”

METHOD

All patients who attended three hospital orthodontic out-patient departments in Manchester for orthodontic treatment were invited to participate during the time period 1st March to 1st April 2007. Data collection consisted of a specially designed single page A4 questionnaire, which consisted of a total of 12 questions answered by way of a series of tick boxes. Only those questions that were applicable were answered by the patient. The patient’s age and gender were requested in respect of personal details. They were asked whether they participated in

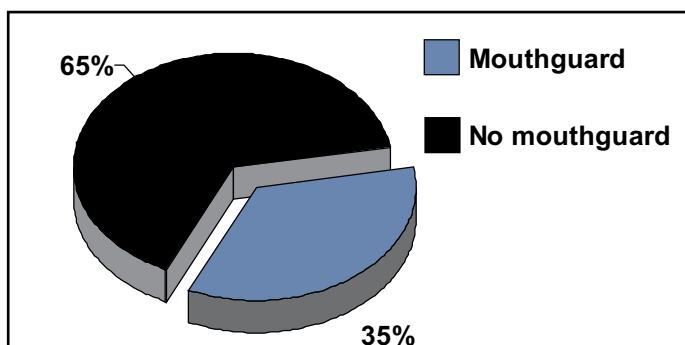


Figure 1. Distribution of patients who wore mouthguards while playing contact sports

sports and to give details. They were then asked whether they wore a mouthguard while playing sports, and if so where they acquired it from. The final part of the questionnaire dealt with issues related to the respondents’ attitudes regarding the role of hospital orthodontic departments in providing mouthguards and the accompanying financial issues. All the questionnaires from the three participating units were collected and data entered into SPSS version 13 for analysis.

RESULTS

In total 136 patients participated in this audit of which 61% were female and 39% male. The average age of the respondent was 15.9 years with an age range of 10 to 43 years. The vast majority of patients (92.6%) wore fixed appliances. Seventy one percent (97/136) of orthodontic patients played at least one sport on a regular basis. The most common sporting activities were hockey, football and netball. From the 97 sports playing patients, 52 were deemed to be involved in a contact sport of whom 35% (18/52) wore a mouthguard for protection as shown in Figure 1. Of these 18 patients, 8 acquired a mouthguard from their general dental practitioner (GDP), 7 from a retail shop and 3 from school. None of them had acquired them from their respective hospital orthodontic departments.

In response to being questioned whether hospital orthodontic departments should provide mouthguards to patients, 74% said yes with 26% responding no, as illustrated in Figure 2. When questioned further that if this were the case, should patients should have to pay for these, 62% felt not while 38% they should. Continuing with the theme of finances, 57% of respondents were prepared to pay for mouthguards themselves whereas 43% were not. Fifty eight percent of respondents were prepared to pay less than £10 for a mouthguard, 28% £10 to £20, 8% between £20 to £30, 4% between £30 and £40 and 2% between £40 and £50.

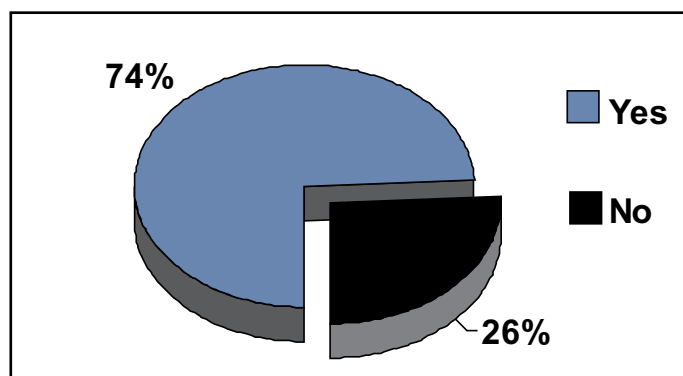


Figure 2. Patients response to whether hospital departments should provide mouthguards

DISCUSSION

From a 100% gold standard set at the beginning, only 35% of orthodontic patients wore a mouthguard for protection of the dento-facial region while participating in contact sports. This is quite clearly below our optimum expectation, especially since all participants in contact sports should be encouraged to wear a mouthguard and not just orthodontic patients. The British Orthodontic Society (BOS) has produced guidance regarding the type of mouthguard it feels is most appropriate for orthodontic patients⁴.

Regarding patient's perceptions to the provision of mouthguards, 74% felt hospital orthodontic departments should provide these, with 62% responding that this service should be provided free of charge for the patient. However, 55% were prepared to pay for the item with the vast majority of patient's (86%) not prepared to pay more than £20. A stock mouthguard currently retails starting from £1.99 plus P&P, whilst a custom made appliance can cost from £29.45.

CONCLUSIONS

1. It is recommended that the importance of mouthguard wear is re-emphasised to all patients at the start of treatment as part of normal instructions, with clearly identified outlets made known to parents and patients.
2. The possibility of selling products directly to patients could

be investigated further as is the case in some hospitals, but would depend on local hospital and trust policies.
3. A re-audit period of 2 years is recommended by the authors.

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AN INVESTIGATION OF PATIENT SATISFACTION ON COMPLETION OF ORTHODONTIC TREATMENT. A REGIONAL AUDIT

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INTRODUCTION

The involvement of patients in clinical audits and acquiring their feedback is a very useful way of assessing ones performance and work, as well as empowering patients by making them feel involved in the decision making process that will ultimately be of benefit for them. This recommendation has been incorporated into the government in the 2000 NHS plan where patient centred care was a major theme.¹ The purpose of this audit was not to investigate the patient's general feelings about the state of the environment they were in, decor or access to parking, but to focus on specific aspects that would be important to them on completing 12 – 24 months of fixed orthodontic treatment.

AIMS

To assess and evaluate the patient's perspective in respect of,

- 1) Their overall relationship with the orthodontist and departmental staff.
- 2) Access to appointments, travel and time-keeping
- 3) The impact of treatment on their lives
- 4) Assessment of the treatment outcomes in terms of dentofacial and psychosocial changes

STANDARDS

An 80% gold standard for patient satisfaction was set after a review of the literature.²

METHODS

The patient inclusion criteria were as follows,

- 1) Completed a course of fixed appliance orthodontic treatment in the last 6 months
- 2) Patients in the final stages of fixed appliance treatment

These patients were invited to complete a short questionnaire, during the time period 1st July to 1st August 2006. Ten regional hospital orthodontic out-patient departments in Manchester were invited and participated in this study.

Data collection was done using a questionnaire consisting of 17 questions (Appendix 1) which accepted responses to questions in the form of a visual analogue scale (VAS), a line 100mm in length with words anchored at each end, expressing the most positive and most negative rating corresponding to the question

asked. Each of the four objective subheadings described above were represented by four questions, which were randomised so as not to lead the patient. The final question encouraged patient comments. All participants were anonymised with only gender and age giving personal details. All the questionnaires from the regional units were collected centrally and data entered into SPSS version 13, for analysis.

RESULTS

There were a total of 140 participants who met the inclusion criteria during this period across 10 regional hospital orthodontic out-patient departments in Manchester. There were 86 (61.4%) female and 40 (28.6%) male respondents, with 14 (10%) incompletely answered. The overall average age of patients was 16 years with a range from 11 to 35 years. Eighty-nine (63.6%) patients had fixed appliance treatment with 29 (20.7%) who underwent both fixed and removable appliances. The overall total patient satisfaction from all 10 regional units was 77.4% with a range varying from 69.8% to 81.3%. Figure 1 illustrates the distribution from all 10 regional units.

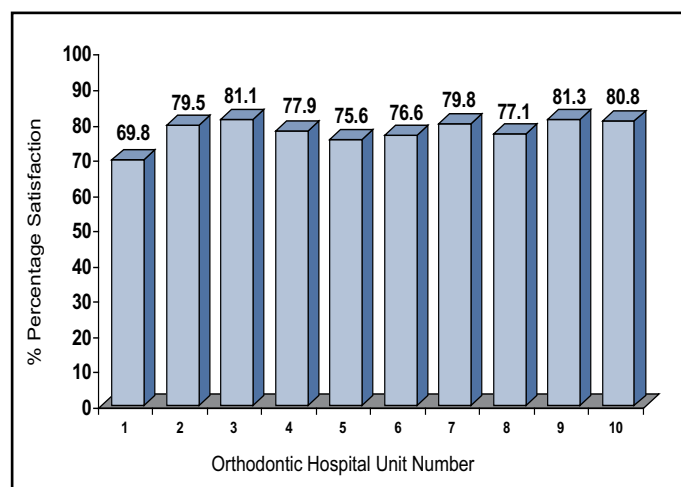


Figure 1. Distribution of overall patient satisfaction across the regional units.

In terms of the overall relationship of the patient with the orthodontist and departmental staff, the average patient satisfaction was 89.8%. Access to appointments, travel and time-keeping yielded a satisfaction rating of 71.3% and the

impact of treatment on the lives of patient's resulted in a 71.0% feedback. Finally, the assessment of the treatment outcomes in terms of dentofacial and psychosocial changes on the patient gave a 77.4% satisfaction score. Table 1 summarises these findings.

Objective	Overall Percentage
Patients relationship with the orthodontist and staff (Questions 1,3,5,7)	89.8 %
Access to appointments, travel and time-keeping (Questions 8,10,11,13)	71.3 %
The impact of treatment on the lives of patients (Questions 2,6,12,14)	71.0 %
Assessment of treatment outcomes (Questions 4,9,15,16)	77.4 %
Overall total regional patient satisfaction	77.4 %

Table 1. Overall patient scores from all the hospital units for each of the four objective subheadings.

DISCUSSION

This project was looking at more than just the patient's satisfaction with the quality and care of treatment received. While trying to ascertain these results, the opportunity also presented to have an insight into other factors that were directly and indirectly related to their treatment and visit to the hospital out-patient department. Of the four subcategories that were being investigated the patient's relationship with the orthodontist and departmental staff resulted in an overall satisfaction rating of almost 90%, which exceeded the set standard. It is satisfying for all concerned to know that their hard efforts were being appreciated by the patients. Seed et al³, Balakrishnan et al⁴ and Lo et al⁵ also demonstrated a similar result for this type of question. The comments made by patients participating in Kindelan's⁶ satisfaction audit support the view that whilst patients are in general very pleased with the outcome of treatment, they do find the duration of wearing the appliance difficult.

The patient's dentofacial and psychosocial changes satisfaction score was 77.4%, coming close to the gold standard set. To this category, patients gave feedback to how they felt about their appearance and smile at the end of treatment, as well their feelings regarding the treatment duration and anticipated changes that may occur to their teeth. Access to appointments, time off from work/school, travel times to the hospital and being seen on time gave a score of 71.3%. The impact of treatment on patient's lives yielded the lowest subcategory satisfaction score of 71.0% which could appear to some to be a disappointing outcome. In this section the patients were asked about the discomfort of wearing a fixed appliance, and difficulties with eating and cleaning teeth. Their response acts as a useful reminder that wearing and maintaining a fixed appliance is hard work for patients, and we as orthodontists expect high standards from them. The standard set at 80% is underestimating the impact of the treatment on their lives, and could be lowered.

CONCLUSIONS

The overall patient satisfaction of 77.4% was very close to the 80% gold standard set at the start. Areas of deficiencies that were identified will be improved upon. In terms of access and availability to appointments advice sheets will be given to patients explaining how to go about this when calling the centralised call centre as well as advising the call centre personnel. On the issue of the impact of treatment on the lives of patients, counselling and advice as well as information will be given to better prepare them for their course of treatment.

The authors recommend a re-audit in the future after at least a two year period.

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Appendix 1 – All the questions asked as they appeared in the questionnaire

QUESTIONNAIRE

1. Was your treatment fully and clearly explained to you before starting?
2. Was it difficult to keep your brace or teeth clean?
3. Was the progress of your treatment clearly explained to you at each visit?
4. Now that you have completed your treatment, do you feel that your teeth look like how you wanted them to before you started treatment?
5. How friendly and caring was the orthodontist to you?
6. Was the brace you wore uncomfortable or hurt your teeth?
7. How friendly and caring was the orthodontist's assistant to you?
8. Did you have to take a lot of time off school/work for your appointment?
9. Do you feel you have a more confident smile now?
10. Do you feel every effort was made to give you an appointment that best suited you?
11. How often were you seen on time by the orthodontist?
12. Did the brace make eating difficult for you?
13. Did you have to travel far for your appointment?
14. Were you ever teased because of the brace you were wearing?
15. Did the total treatment time take as long as you expected?
16. How happy do you feel with your appearance since having orthodontic treatment?
17. If you have any other comments about your treatment or about the hospital department then please write in the space below.

A SURVEY OF CLINICAL PHOTOGRAPHY PRACTICES IN HOSPITAL DEPARTMENTS IN THE WESTMIDLANDS REGION

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INTRODUCTION

Clinical photography is an essential tool in modern orthodontics. Photographs can be used to aid treatment planning (history taking and diagnosis), evaluation of treatment carried out (tooth movements and mechanics) and also for teaching purposes from formal lectures to simple chair-side patient education.

From a medicolegal viewpoint, photographs can be helpful in obtaining informed consent, and provide clear images of baseline presentation as well as treatment progress.

The British Orthodontic Society, in their "Advice Sheet 5" stipulate that there are no clear guidelines on the use and storage of digital photographs, as advice differs between trusts. However, it must be recorded when they are taken and if it is possible to recognise an individual, specific written consent is required.¹ This is echoed in the guidance from Department of Health² and the Institute of Medical Illustrators.³ The Data Protection Act (1998) further emphasises the need for added security of images taken.

A suitable camera should be reliable, simple, have a macro lens with consistent magnification, have a good quality flash and produce good image quality.

In recent times professional digital imaging has been proven to be the most acceptable form of image capture due to its many advantages including rapid review of image quality and ease of storage.^{4,5}

AIMS

To assess the current photographic practices of Hospital Orthodontic Departments within the West Midlands region with regards to clinical photography.

MATERIALS AND METHODS

The study was an email-based questionnaire to all consultants within the region 2005-2006. Questionnaires were emailed to all orthodontic consultants in the West Midlands region. They were asked to report:

- Who took their clinical photographs?
- How often photographs were taken?
- What they thought photographs were useful for?
- Whether separate photographic consent was taken?
- What format images were stored in?
- How images were stored and backed up?
- Which cameras were used?

The responses were then compared to current recommendations and guidelines for clinical photography.^{1,2,3}

RESULTS

Who took the photos?

The response rate was 81%. Only 10% of the consultants questioned had attended a course on clinical photography. 80% of the orthodontic departments were taking their own clinical photographs, the rest being taken by medical illustration departments. In 80% of the departments, the orthodontic trainees were taking their own photographs.

How often were photographs taken?

With regard to the frequency of obtaining images; start and finish series were taken by 90%, with 80% taking at least one mid-treatment series.

What were the photographs useful for?

There was universal agreement that photographs were useful in demonstrating potential treatment options and in lectures (100%). The figure was also high for their potential use in publications (90%). In terms of demonstrating treatment success (80%), treatment planning (70%) and monitoring treatment (60%) the figures decreased.

Was separate photographic consent taken?

Only 40% of respondents were taking separate photographic consent within their departments (Figure 1).

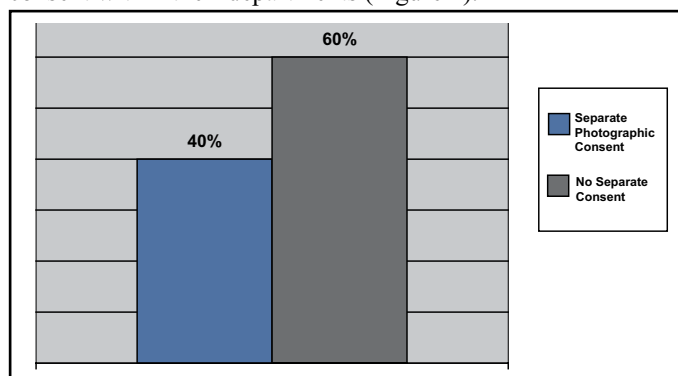


Figure 1. Record of separate photographic consent

What format were the images stored in?

There was an equal split between the formats used for taking clinical photographs. Of the non-digital images, 30% were processed using slides and 20% were processed on photographic film (Figure 2).

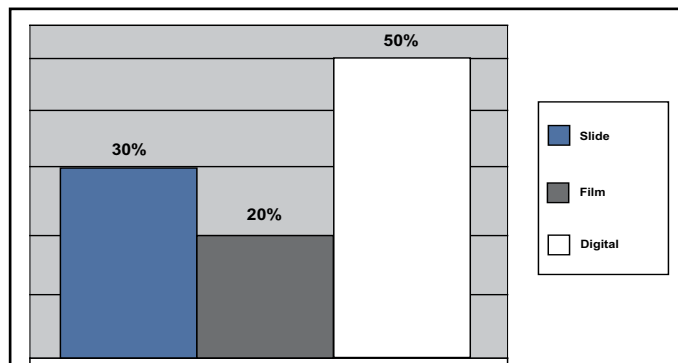


Figure 2. Image Format

How were images stored and backed up?

Of the digital images taken, 12% were stored on the hospital server, 25% were printed and stored as hard copies, 25% were stored as a Windows file and 38% were stored in a separate orthodontic program.

Digital images were backed up on CD/DVD (40%), hospital server (50%) and on a PC hard drive (10%) (Figure 3).

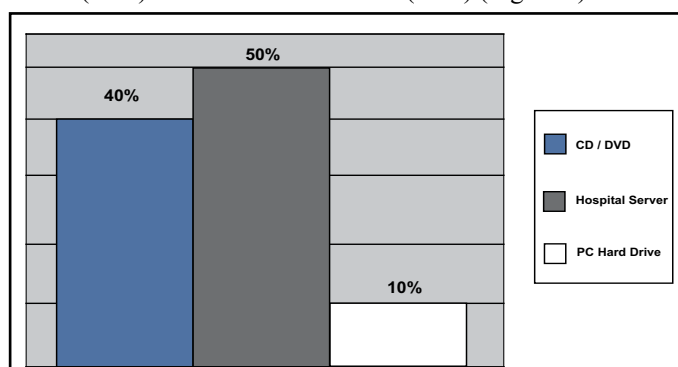


Figure 3. Digital Image Backup

Which cameras were used?

There was a variety of cameras used across the region. The most popular was the Nikon D100 (20%). Other cameras included:

- Canon EOS 5D
- Nikon 4500 Prosumer
- Nikon F100 SLR
- Pentax K1000SLR
- Minolta DiMAGE
- Fuji S1 Pro
- Fuji S2 Pro

DISCUSSION

It is reassuring to see that most departments and trainees were taking their own photographs. Rather surprisingly, only 10% of the consultants had attended a relevant course themselves. This may bring into question the quality/relevance/appropriateness of photographs taken. In the West Midlands region however, all first year Specialist Registrars attend a recognised course in clinical photography as part of their induction process. The frequency was at the very least adequate with most departments taking start, finish and at least one mid-treatment photographic series.

Slightly disappointing was the fact that clinical photographs were not being used routinely for treatment planning and monitoring treatment progress. In the authors' opinion these images provide a very useful aid to history taking, diagnosis and patient progress particularly in the early stages of orthodontic postgraduate training. The images can be reviewed outside of clinical time and magnified on screen. Many features that could have been missed in the original clinical examination and on a very busy teaching clinic can often be picked up. Together with study models and radiographs, they can assist in the treatment planning process. Serial photographs provide the patient and clinician a guide to treatment progress and allow tooth movements and mechanics to be evaluated. The original malocclusion may be recalled and any changes judged accordingly.

Informed consent is a medico-legal requirement in orthodontics. One survey showed that of the 222 consultant orthodontists held on the database of the British Orthodontic Society, only 41% of clinicians obtained written consent prior to commencing treatment.⁶ Clinical photography can be both an aid to obtaining informed consent and requires separate written consent itself, especially if an individual may be recognised. The Department of Health further states that it must be explained to the patient why the image is being taken and its intended use. Consequently the finding from this study that only 40% of orthodontic departments within the West Midlands were taking a separate consent for clinical photographs is a

concern. An example of a comprehensive photographic consent form is included in the appendix.

It is encouraging that half of the respondents were using digital photography and storing images in this format. It is surprising that 30% were still processing images in slide format. Hopefully this is a trend that will only fall further with improved technology and lower costs of digital cameras.

The wide variety of cameras used reflects the personal preferences of the various consultants questioned and the time at which they moved to digital imaging. With a large variety of cameras on the market proposing high quality images, this is to be expected. The most popular camera (Nikon D100), together with the Fuji S1/S2 Pro is amongst those recommended for orthodontic use.⁷

The hospital server is likely to be the most secure place to store a large number of digital images with the greatest capacity and this is reflected in the study with 50% of respondents storing images in this way.

CONCLUSIONS

More consistency is required across the region and the departments should conform to current recommendations.

RECOMMENDATIONS

- Trainees should at least attend a relevant course, even if they don't have the facilities at their place of training
- Each case should have at least start, mid treatment and finish photos
- Separate consent is required for clinical photographs
- To comply with Department of Health, Data Protection Act and current recommended guidelines

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NATURAL RUBBER LATEX ALLERGY: A REVIEW AND AUDIT OF CLINICAL MANAGEMENT PROTOCOLS

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INTRODUCTION

Allergies associated with rubber fall into either immediate hypersensitivity Type I or delayed hypersensitivity Type IV reactions. The former are due to the natural proteins found in rubber latex, while the latter are in response to the residues of the accelerating agents used in the manufacturing process such as thiurams, carbamates, and benzothiazoles. Atopic individuals who display Type I anaphylactic reactions to rubber have a natural rubber latex (NRL) allergy, with a general incidence in the population of less than 1%.^{1,2} Those whom have a localised Type IV reaction are often erroneously

presumed to have a latex allergy when in fact they only have an allergic contact dermatitis or rubber chemical allergy. The differentiation between the two is both clinically and economically important, because in comparison the smaller number of patients affected by Type I reactions need extremely careful and time consuming management.

Overall, between six and twelve per cent of dental professionals have been found to develop Type I latex rubber hypersensitivities,^{3,4,5} with powdered gloves being known to exacerbate this risk through the production of latex protein aeroallergens.^{6,7} Seven per cent of dentists also develop Type

IV rubber chemical allergies,⁸ as do twelve per cent of health care workers (HCWs) in general.⁹

In this regard, all clinical environments should have customised written policies on how to screen and manage patients and staff who report they have a latex allergy, as well as protocols for minimising the factors which predispose towards health care worker (HCW) sensitisation.^{6, 7, 10, 11}

With this in mind, an NRL allergy audit to screen hospital orthodontic departments in the East of England was undertaken.

AIMS AND OBJECTIVE

- determine the level of knowledge and understanding of NRL allergy amongst consultant and trainee (FTTAs and SpRs) hospital orthodontists
- identify the existence of written departmental policies on the safe management of NRL sensitised individuals
- compare performance against previously published general dental practitioner (GDP) data
- encourage adoption of the guidelines of the faculty of General Dental Practitioners of the Royal College of Surgeons of England for the management of natural rubber latex allergy in patients and HCWs.⁷

SUBJECTS AND METHODS

In 2006, 15 consultant and 13 trainee orthodontists from the East of England answered a questionnaire on NRL allergy which had been used previously by 766 Yorkshire general dental practitioners (GDPs).¹²

Subsequent to discussing the preliminary findings together with practical resuscitation training for anaphylaxis, the following were adopted:

AUDIT STANDARDS

- 70% mean level of NRL allergy knowledge amongst all participants (Tables 1, 2, 3 & 4)
- Establish written NRL allergy policies for all departments
- Exclusive use of non-powdered gloves

In 2007, the same questionnaire was re-issued and completed by all the clinicians.

RESULTS

Experience and knowledge of NRL allergy (Table 1)

- Initially, a minority knew that the population incidence of NRL allergy was less than 1%, but during the audit the consultants alone reached the agreed standard
- Only a minority initially knew that latex proteins alone cause NRL allergies. During the audit this improved, but not sufficiently to reach the standard.

Willingness to accept an NRL sensitised patient for treatment, and self assessed ability to provide this safely (Table 2)

- Initially, all of the consultants and three quarters of the trainees would treat an NRL sensitised patient. Paradoxically, many less felt competent to manage a subsequent severe allergic reaction.
- During the audit, slightly fewer consultants and noticeably more trainees reported that they would treat such patients, altogether with increased confidence in their self-perceived ability to manage a severe allergic reaction. NRL Policies and glove use (Table 2)
- During the audit, just over two thirds of the consultants had organised written NRL departmental policies, however, many less trainees were subsequently made aware of their existence.

- The prevalence of non latex glove use noticeably increased during the audit
- Initially, just over a third of consultants and almost a quarter of trainees who used latex gloves could quote their protein content, and while this improved during the audit, the standard was still not met.

Awareness of which dental and orthodontic products could initiate an allergic reaction

- Apart from rubber gloves, during the audit the appreciation that any other latex dental item could pose a risk remained below the audit standard (Table 3)
- Similarly, apart from latex elastic bands, the appreciation that any other latex orthodontic product could initiate an allergic response in a sensitised individual failed to reach the audit standard (Table 4)

DISCUSSION

Almost double the proportion of consultants as compared to the GDPs initially felt fully aware of the problems associated with NRL (table 1) and this is perhaps related to one of their roles, namely the acceptance of patients with complex medical histories with or without difficult malocclusions to treat. That the trainees' level of awareness of NRL allergy problems almost doubled during the audit is perhaps testament to the effect of the education and the practical resuscitation training which was received.

While it was encouraging to see an increase during the audit in the consultants' and trainees' appreciation that the incidence of NRL allergy in the population is quite small, it was nevertheless disappointing that many were still unclear that it is only a single allergen that can initiate a true latex allergy (table 1).

Of the GDPs who would not treat an NRL atopic patient, two thirds would refer them to a dental hospital, with the remainder referring to a community dental service or a dental department of a general hospital.¹² Evidence that this would seem to occur is supported by the number of consultants and trainees who reported they would be prepared to treat such patients (table 2). Nevertheless, it was therefore perturbing that only 40% of the consultants and 62% of the trainees initially felt competent to manage a severe allergic reaction which could arise as a result. However, it was reassuring that as a consequence of the anaphylaxis resuscitation training, during the audit this self perceived competence markedly increased to 85%.

While it was encouraging that during the audit most consultants had produced written NRL allergy departmental protocols based on other sources,^{7, 14} the audit standard of total regional compliance was, however, not achieved. In addition, only a minority of trainees came to know of the existence of these policies, suggesting a failure in communication had occurred from their consultants (table 2).

Not surprisingly, the use of non-powdered latex gloves predominated in the initial survey and subsequent audit, but with a noticeable increase in the use of non-latex gloves in between. However, one of the trainees had begun to use powdered latex gloves despite the associated risks¹⁵ which is a cause for concern (table 2).

When donning latex gloves for clinical use, the importance of selecting brands which have minimum levels of protein content (< 50 micrograms per Gram) has previously been emphasised, primarily as a means of reducing the risk of subsequent HCW sensitisation.⁷

Despite the pre-audit education, a majority of those consultants and trainees who were still using NRL gloves in the audit could

Questions	GDP Response* 2004	Consultant Response 2006	Consultant Response 2007	Trainee Response 2006	Trainee Response 2007
	n = 766	n = 15	n = 13	n = 13	n = 13
Are you fully aware of the problems caused by NRL allergy?					
Yes	287 (38%)	10 (67%)	12 (92%)	4 (31%)	8 (61%)
What's the general population incidence of NRL allergy?					
<1%	408 (58%)	4 (27%)	10 (77%)	2 (15%)	9 (69%)
1%	-	4 (27%)	2 (15%)	5 (38%)	2 (15%)
5%	-	6 (40%)	0	1 (8%)	2 (15%)
10%	-	0	1 (8%)	3 (23%)	0
>10%	-	1 (6%)	0	2 (15%)	0
What causes latex allergy?					
Glove Powder	-	6 (40%)	1 (8%)	5 (38%)	3 (23%)
Chemical Additives	-	8 (53%)	4 (31%)	8 (62%)	4 (31%)
Latex Proteins	-	15 (100%)	13 (10%)	12 (92%)	13 (100%)
Other	-	1 (7%)	0	2 (15%)	0
Only Latex Proteins	645 (84%)	6 (40%)	9 (69%)	4 (31%)	7 (54%)

Table 1. The GDP, Consultant and Trainee level of Understanding of NRL Allergy

* CLARKE, A. BR DENT J 2004; 197: 749-752

Questions	GDP Response* 2004	Consultant Response 2006	Consultant Response 2007	Trainee Response 2006	Trainee Response 2007
	n = 766	n = 15	n = 13	n = 13	n = 13
Would you treat an NRL sensitised patient?					
Yes	522 (69%)	15 (100%)	12 (92%)	10 (77%)	11 (85%)
Do you feel competent to manage a severe allergic reaction?					
Yes	437 (57%)	6 (40%)	11 (85%)	8 (62%)	11 (85%)
Do you have written policies for the management of NRL sensitised patients and staff?					
Yes	67 (9%)	3 (20%)	9 (69%)	3 (23%)	5 (38%)
Which Type of gloves do you routinely use?					
None	7 (1%)	0	0	0	0
Powdered Latex	123 (16%)	0	0	1 (8%)	1 (8%)
Non-powdered Latex	572 (75%)	11 (73%)	8 (62%)	12 (92%)	8 (61%)
Powdered non-latex	0	1 (7%)	0	0	0
Non-powdered non-latex	59 (8%)	3 (20%)	5 (38%)	0	4 (31%)
If you use latex gloves, can you state the protein content? (< 50 micrograms / Gram)					
Yes	85 (11%)	4 (36%)	3 (38%)	3 (23%)	4 (44%)

Table 2. The GDP, Consultant and Trainee NRL Allergy Management Protocols

* CLARKE, A. BR DENT J 2004; 197: 749-752

	GDP Response* 2004	Consultant Response 2006	Consultant Response 2007	Trainee Response 2006	Trainee Response 2007
	n = 764	n = 15	n = 13	N = 13	n = 13
Gloves	688 (90%)	12 (80%)	12 (92%)	13 (100%)	13 (100%)
Rubber Dam	588 (77%)	5 (33%)	7 (54%)	7 (54%)	7 (54%)
Local Anaesthetic Cartridge	92 (12%)	4 (27%)	7 (54%)	2 (15%)	5 (39%)
Prophylaxis polishing cup	191 (25%)	4 (27%)	6 (46%)	2 (15%)	2 (15%)
O₂ Resuscitation equipment	53 (7%)	3 (20%)	4 (31%)	0	1 (8%)

Table 3. Number of respondents who correctly identified five potential general dental NRL allergy hazards⁽⁷⁾ * CLARKE, A. BR DENT J 2004; 197: 749-752

	Consultant Response 2006	Consultant Response 2007	Trainee Response 2006	Trainee Response 2007
	n = 15	n = 13	n = 13	n = 13
Elastic Bands	13 (87%)	11 (85%)	9 (69%)	11 (85%)
Elastomeric Modules	7 (47%)	8 (62%)	10 (77%)	8 (62%)
Powerchain	7 (47%)	5 (39%)	7 (54%)	5 (39%)
Separators	8 (53%)	5 (39%)	7 (54%)	6 (46%)
Head Gear Components	0	2 (15%)	7 (54%)	2 (15%)

Table 4. Number of respondents who correctly identified five potential orthodontic NRL allergy hazards⁽¹³⁾

not quote the protein content of them. Such a disregard could potentially leave any individual vulnerable to an increased risk of latex sensitisation, on the basis that they might unwittingly be using a brand of glove with a high protein content.

With regard to the general dental and orthodontic products which could potentially pose an NRL allergy hazard (tables 3 and 4), apart from rubber gloves and removable latex elastics respectively, during the audit both the consultants and trainees failed to reach the audit standard of identification for the remainder, bearing in mind that such items should have been included as a list of those to avoid in their written departmental NRL allergy policy documents, as could a number of others have been, such as rubber based alginate mixing bowls, face masks with elastic straps, and posterior band removers with their rubber pads etc.^{7, 13}

CONCLUSIONS

The audit resulted in an improvement in the knowledge and understanding of most parts of the NRL allergy, some of which reached the agreed standard while others did not. With educational reinforcement and additional episodes of audit, further improvement in these preliminary results would be expected.

ACKNOWLEDGEMENT

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HOW APPROPRIATE ARE ORTHODONTIC REFERRALS?

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INTRODUCTION

Inappropriate referrals have been considered to be one of the main reasons for increases in waiting lists for orthodontic appointments.¹

The introduction of the new contract on 1st April 2006 has rationalized the provision of orthodontic care in the primary sector with increasing numbers of practices imposing stricter acceptance criteria. Consequently, it has been proposed that the number of referrals that would be considered routine, and hence, inappropriate, are increasing.²

AIM

To evaluate the appropriateness of referrals made to the orthodontic department in a district general hospital.

STANDARD

The audit standard was set at 95%.^{2,3} This meant that no greater than 5% of referrals should be considered inappropriate. Appropriate referrals had to fulfill certain requirements that were based on those outlined in a previous study.¹

At the new patient clinic attendance, the patient should:

- be in need of treatment (Index of Orthodontic Treatment Need 4 or 5)
- be willing to wear appliances
- have satisfactory oral hygiene
- have satisfactory general dental health
- be of an appropriate age.

METHOD

An audit sheet was devised focusing on the findings at the consultation and used a tick box design in order to simplify completion. Four consecutive new patient clinics were audited. Three clinicians saw patients on these clinics and they completed the audit sheet.

RESULTS

A total of 92 patients (88%) attended out of a potential 104 and therefore, analysis was limited to the 92 patients that attended as shown in figure 1.

Fifteen patients were aged 10 or less, 40 patients were between 11 and 13, 25 patients were between 14 and 16 and 12 patients were aged 16 and above.

The vast majority (74) of patients came from general dental practitioners while specialist orthodontists accounted for 14 referrals. A proforma with or without an accompanying letter had been used in 58 cases (equal numbers were orthodontic proformas and general dentistry proformas) and 34 patients had been referred with letters without proformas.

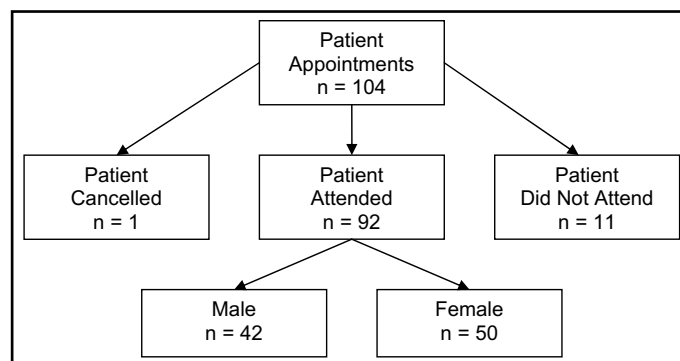


Figure 1. Flow diagram of the patients with appointments.

The Index of Orthodontic Treatment Need (IOTN) was only recorded in five referrals, all of which stated that the IOTN was three or greater. The actual IOTN recorded at the consultation is illustrated in figure 2 which shows 70 referrals (76%) were an IOTN of 4 or 5.

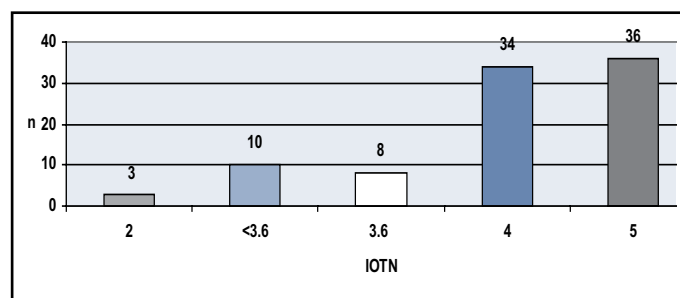


Figure 2. Actual IOTN recorded at the consultation of the 92 referrals.

The criteria used for assessing the appropriateness of the referral were evaluated and are shown in table 1

Criteria	n	%
IOTN 4 or 5	70	76
Patient willing to undergo treatment	82	89
Oral hygiene found to be satisfactory	72	78
General dental condition found to be satisfactory	83	90
Patient considered to be of appropriate age	69	75

Table 1. Evaluation of appropriateness of the 92 referrals.

Based on the strictest conditions, applying all five criteria in table 1 found only 36 referrals (39%) appropriate out of the 92 patients seen. The standard of 95% was therefore not met. Even if individual criteria were used, no single condition would have met the standard.

DISCUSSION

The number of appropriate referrals (39%) in this audit fell well short of the standard when applying the strictest criteria. When O'Brien et al¹ applied the most severe definition for counting inappropriate referrals, only 54% of referrals were considered appropriate. Much higher figures have been produced by similar audit projects ranging which revealed the appropriate referrals to range from 66% to 92%.²⁻⁴ Seventy-six percent of referrals were an IOTN 4 or 5. While this percentage is relatively high, it still falls short of the 95% standard. Local waiting times and the availability of treatment have been raised as being factors that could influence a referral being made² and it is possible that with changes in commissioning rules, dentists are referring more routine patients to the hospital service. Additionally, practitioners have been known to refer low IOTNs with a comment that they are just seeking confirmation for the patient or parent.⁵ The standard of 95% may therefore be unrealistically high. It has been proposed that the referrer is best placed to assess motivation and likely cooperation as he/she has had longer personal contact with the patient than the orthodontist.¹ It is therefore reassuring to know that 89% of patients that attended were prepared to wear orthodontic appliances. The percentages of patients who had poor oral hygiene, poor dental care or were not ready for treatment, are similar to those in another audit.³ A recent article on making appropriate orthodontic referrals emphasizes that patients who have poor oral hygiene or active caries should not be referred unless there

is an urgent clinical need.⁶

CONCLUSION

Other authors have found that up to 54% of referrals could be classified as appropriate and therefore, the remainder were contributing to the long waiting lists.¹ The present audit found 39% of referrals being classified as appropriate when using the strictest criteria.

Action points to improve the appropriateness of referrals include clearer correspondence to referrers when returning patients to their care and the timetabling of a course for referrers on the appropriateness of orthodontic referrals. Discussions will also take place within the Managed Clinical Network to introduce a regional referral proforma. It would be important to re-audit the new patient referrals to assess if improvements in the referral pattern are taking place. This will be particularly interesting as changes continue to take place in commissioning arrangements in both the primary and secondary care sectors.

The difficulty in defining what constitutes an inappropriate referral for orthodontic treatment has been highlighted¹ and perhaps better guidelines are needed for practitioners in order to reduce the number of inappropriate referrals.

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THE QUALITY OF NOTE KEEPING IN AN ORTHODONTIC DEPARTMENT – REVISTED

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INTRODUCTION

Good note keeping is part of good clinical practice to ensure quality care for patients. As part of NHS (General Dental Services Contracts) Regulations 2005 all clinicians are required to keep clear, legible and contemporaneous patient notes¹. The notes should be legible, kept up-to-date and accurate so that correct treatment can be instigated. Excellent note keeping helps the clinician and other health professionals understand what was done, when and more importantly how and why it was done². With an increase in patient awareness a high standard of note keeping would be expected essentially to defend any medico-legal case.

As part of clinical governance at Queen's Medical Centre (QMC) an action plan has been implemented throughout the hospital and includes a trust protocol on clinical records to be audited regularly. To comply with the trust policy this audit was undertaken to assess the standard of note keeping in the orthodontic department at QMC.

AIMS

- To assess the standard of note keeping by the clinicians in the orthodontic department at the QMC and compliance with the trust's protocol³.
- To implement any necessary changes to current practice and re-audit to assess improvements in the quality of note keeping.

GOLD STANDARDS

The gold standard for the preliminary audit was set at 100% compliance with the trust's protocol³ (Figures 1a and 1b). This meant that all clinical notes examined should satisfy the standards stated in the trust's protocol³.

The gold standard for the subsequent re-audit was set at:

- 90% compliance with the revised protocol meeting the standards set by the British Orthodontic Society⁴ and American Academy of Paediatric Dentistry⁵ (Table 1)
- 100% compliance with the trust's protocol³ (Figures 1a and 1b).

AUDIT PROCESS

The preliminary audit was carried out in January 2005 when 30 sets of clinical notes for each clinician in the department were randomly selected by the administrative staff and given to the author and an experienced dental nurse to examine and complete a pro-forma for each set of notes. In total 90 sets of notes were audited. The original pro-forma consisted of 10 statements as mentioned in Figures 1a and 1b. All statements except statement 7 were marked with a yes or no depending on the outcome. The data were transferred to a Microsoft Excel spreadsheet and results analysed using descriptive statistics.

When the audit was presented at the departmental meeting, there was a general consensus that the trust's protocol³ on note keeping was very basic and did not cover all aspects of good note keeping. It was therefore decided to update the protocol using guidance from BOS guidelines⁴ and clinical guidelines from the American Academy of Pediatric Dentistry⁵. A revised protocol and pro-forma with headings shown in Table 1 were formatted and used for the subsequent re-audit in October 2006. The re-audit was undertaken 21 months after the preliminary audit using the initial trust protocol³ to complete the audit cycle and a new revised protocol (Table 1) so that any improvement in initial standards could be compared.

RESULTS

The results of the preliminary audit and subsequent re-audit are displayed in Figures 1a and 1b below.

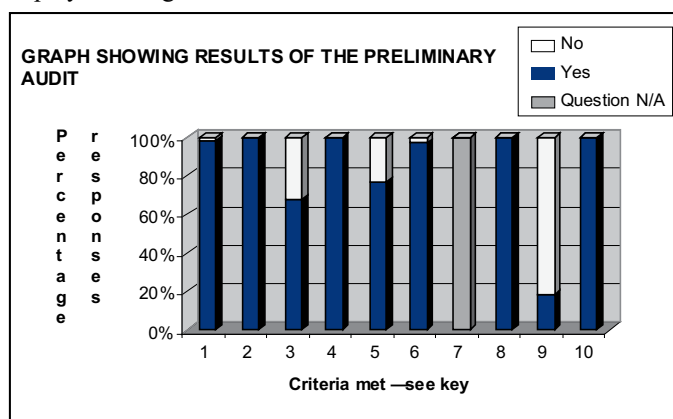


Figure 1a: Preliminary audit results – January 2005

Key to figures 1a & 1b

1. The patient's details on top of each continuation sheet
2. Date prefix against each entry
3. A legible and readable signature
4. Notes which are legible
5. An obvious diagnosis
6. A summarized treatment plan at the end
7. Further investigations filed in the notes
8. Documentation of who saw the patient
9. The name of the consultant the patient is under
10. A discharge letter in the notes

The preliminary audit showed 100% compliance with statements 1,2,4,6,8 and 10. In 35% of notes the signature was not legible and in 28% of the notes the diagnosis was not obvious. The name of the clinician treating the patient was missing in 82% of notes reviewed. Statement 7 regarding further investigations was not applicable to this audit and therefore not included. Only 18% of the notes reviewed met the gold standard.

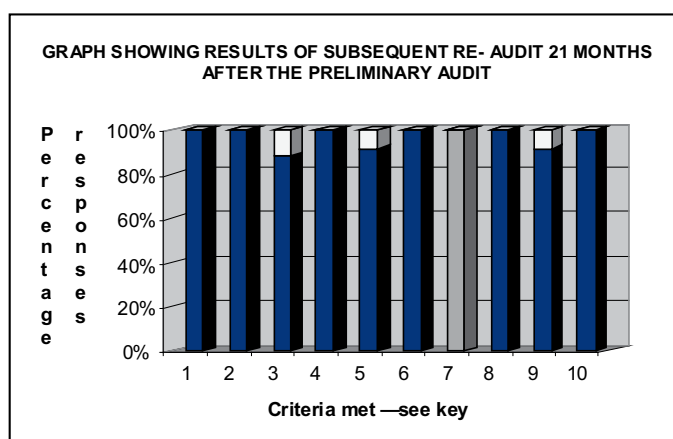


Figure 1b: Re-audit results – October 2006

Results from the subsequent re-audit showed a considerable improvement in statements 3, 5 and 9 of the trust's protocol³. For statements 1,2,4,6,8 and 10 a 100% compliance was achieved again. An overall 88% of the notes reviewed met the gold standard.

Details in the new pro-forma	Percentage of notes meeting the gold standard
Personal details	
Patients Name	100
Date of birth	100
Hospital number	100
Address	100
Telephone number	72
Medical, dental and social history	
General medical practitioner details	100
General dental practitioner details	98
Medical history updates	54
Referral details	100
Patients presenting complaint	100
Clinical examination details	
Extra-oral examination	100
Skeletal	100
Soft tissues	100
Habits	80
Intra-oral examination	
Charting of teeth present	100
Oral hygiene and periodontal assessment	90
Details of orthodontic examination	100
Radiographic investigations and report	100
Assessment & treatment planning	
IOTN (Level of treatment need)	95
Clear orthodontic diagnosis	91
Problem list	80
Treatment aim and options for treatment	100
Treatment plan	100
Details of discussion of treatment plan	100
Details of consent procedure	100
Details of treatment undertaken	100
Details of any mishaps and complications	88
Treatment Outcome	95
Correspondence letters	
Initial assessment	100
Discharge	100
Other details	
Entries dated and signed	100
Name of clinician	92
Written in black ink	98
Clarity and legibility	88
Defined abbreviations used	96
Amendments apparent	100

Table 1: Showing a summary of the new pro-forma

The results from the revised pro-forma showed that details of medical history updates (54%) and telephone numbers (72%) were least compliant with the gold standard. Other details that didn't meet the gold standard included habits (80%), problem list (80%), details of complications (88%) and legibility (88%).

Reliability between the author (JS) and dental nurse was also assessed. There was good reliability shown between the two assessors at 90%.

DISCUSSION

Statement 7 from the trust's protocol³ regarding further investigations was eliminated from both audits since it is seldom necessary to have further investigations for orthodontic patients apart from radiographs which were readily available whenever required. This statement is more applicable to other surgical specialties.

The results of both audits were presented and discussed at the departmental audit meetings. After the preliminary audit a stamp for each clinician with their name and position were introduced and the new patient assessment form was modified to have a clear diagnosis section. Also a new departmental protocol using guidance from BOS guidelines⁴ and clinical guidelines from the American Academy of Pediatric Dentistry⁵ was formatted.

Despite 88% of notes meeting the trust's protocol³ in the subsequent re-audit, essential details like patient's telephone number and medical history updates were either not updated or missing. This was revealed when the results from the new pro-forma audit were analysed (Table 1). Similar findings have been reported in another audit on note-keeping⁶. Contact information is essential if the patient needs to be contacted urgently and it is essential to update medical history regularly as described in GDC good practice guide. Since the audit, the reception staff have been trained to update personal details every time the patient is seen. The medical history form is given to the patient at each visit to update and the clinician records any changes in medical history in the notes. The drive for improving the quality of note keeping lies with individual healthcare professional to read guidelines on the information that they are expected to record in patients' notes. A checklist to act as an aide-memoir has been formatted and attached to the patient's notes to help the clinician record all the necessary details legibly in the notes.

Recently there has been a move by the Health Informatics Unit (HIU) of the Royal College of Physicians in London to publish a generic record keeping document which sets the standard for general note keeping for physicians in hospital practice⁷. In light of this document the departmental protocol will need to be updated to reflect any new requirements set out in this document.

CONCLUSIONS

- The original audit showed only 18% of the notes met the trust's protocol. Changes were implemented before re-auditing.
- The subsequent re-audit showed considerable improvement in the quality of note keeping showing 88% of notes met the trust's protocol.
- The revised pro-forma showed essential details like the patient's telephone number and medical history updates were either not updated or missing. Changes have been implemented to improve current practice and this will be re-audited in 2-3 years.

FUTURE RECOMMENDATIONS

- The revised protocol to be introduced to all new employees in the department during their induction training.
- Revise the new departmental protocol to meet the standards for general note keeping for physicians in hospital practice⁷ and complete the audit cycle after 2-3 years.

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AN AUDIT OF MINI-IMPLANT SUCCESS RATES

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INTRODUCTION

Mini-implants have become a viable adjunct in orthodontics in recent years and their use is becoming increasingly popular for anchorage reinforcement in all three dimensions. The success of mini-implants has been the subject of a number of published studies¹⁻¹³. These studies have described some variations in the success rates of mini-implants, but a reasonable consensus is evident in the literature with overall success rates in the range of 80-90%. Variations in success rate have been attributed to a number of factors such as patient age, insertion site, insertion technique, implant design, orthodontic loading, latency period and oral hygiene. Authors of previous studies have often defined success as the mini-implant remaining clinically

stable under orthodontic loading for a minimum of 6 months. However, the recent study by Moon et al. (2008) which is the largest consecutive case series to date (480 mini-implants), found that 92% of their mini-implant failures occurred within four months of insertion.⁸ Furthermore, Park et al. (2006) showed that 20% of their successful mini-implants showed minor degrees of mobility yet were functionally stable.¹¹

AIMS

The aim of the audit was to determine the success rate of the orthodontic mini-implants inserted at Peterborough District Hospital during 2007, and to identify the possible causes of any failures.

GOLD STANDARD

80% of the mini screw implants inserted in 2007 should function for at least 4 months. This time period was chosen in light of the aforementioned study by Moon et al⁸ who showed that the vast majority of failures become evident during this period.

MATERIALS AND METHOD

All of the patients who had mini-implant insertions solely for orthodontic tooth movement in 2007 were identified from a departmental bone anchorage database and their records analysed. Patients were excluded if their mini-implants were used solely for intermaxillary fixation / traction. All of the mini-implants used during this period were Infinitas (DB Orthodontics, UK; www.infinitas-miniimplant.com) with body dimensions of 6mm or 9mm length and 1.5mm or 2mm diameter. These mini-implants are routinely inserted manually with a self-drilling technique. A stent was used when it was felt that access to the insertion site was difficult and/or the insertion procedure was being carried out by a surgeon when an orthodontist would not be present. A pilot drill was never used, however a cortical bone punch became available in the latter half of 2007 and was used for subsequent mandibular insertions.

None of the operators had received formal training in the mini-implant system, however the consultant orthodontist had considerable experience in its use.

All implants were loaded immediately with light elastic traction. The majority of patients had elastomeric link traction, although in a few cases power chain was used.

Note was made of any mini-implants that were removed prior to completion of the anchorage objectives. In each of these cases the anatomical insertion site, the dimensions of the mini-implant(s) and the insertion technique details were noted. Cases with unsuccessful mini-implants were then assessed on an individual basis in order to determine a possible reason for the failure.

RESULTS

59 mini-implant insertions, in a total of 29 patients, met the audit criteria. In total, 47 (80%) of these mini-implants were successful in 21 of the patients. For the majority of these 29 patients, the mini-implants were used for incisor retraction or molar distalisation. However, other uses included incisor and molar intrusion. For the purpose of this audit the uses of the mini-implants have not been specifically mentioned as the subgroup numbers are too small for meaningful analysis. 52 of the mini implants were placed by one orthodontic consultant. One implant was placed by a 2nd year orthodontic specialist registrar, and 6 implants were placed by consultant maxillofacial surgeons under general anaesthetic. Of those placed under general anaesthetic, one patient had 2 inserted at the time of 3rd molar removal, and the other had 4 implants inserted by another surgeon at the time of an osteotomy. Ten insertions involved guidance stents. Four were used by the surgeon in the osteotomy case and 6 by the orthodontic consultant in palatal alveolar sites.

There was no evidence of contact/damage to roots of adjacent teeth, but close proximity between a mini-implant and root was thought to have contributed to instability in some of the unsuccessful mini-implants.

The success rate relative to the anatomical insertion sites and screw body dimensions are detailed in Tables 1 and 2.

Mini-implant Location	Number Successful (Total Number Inserted)	Percentage Success Rate
Maxillary buccal alveolus	26 (27)	96
Maxillary palatal alveolus	8 (10)	80
Mandible	13 (22)	59
Anterior to canines *	8 (8)	100
Posterior to canines *	39 (51)	76

Table 1. Mini-implant success rates according to anatomical location.

* Both maxillary and mandibular sites.

Dimensions	Number Successful (Total Number Inserted)	Percentage Success Rate
Length	6mm	0 (3)
	9mm	47 (56)
Diameter	1.5mm	44 (56)
	2.0mm	3 (3)

Table 2 . Dimensions of successful implants

Of the 12 mini-implants that were not successful, 8 were replaced as the cause of failure could be explained and the problem overcome. Four mini-implants were not replaced, and in these cases the treatment plan was modified accordingly.

DISCUSSION

Overall, 12 mini-implants failed in 8 patients. Each failure was assessed in turn, as detailed below. However findings in small subgroups (eg 6mm length, 2mm diameter or anterior insertions) were interpreted with caution as the numbers in these groups were small.

Mandibular failures

Nine out of 22 mandibular mini-implants failed. This 59% success rate is lower than that described in the literature and below the overall gold standard for this audit. One 9mm mandibular mini-implant was removed prematurely due to acute gingival infection. The infection resolved quickly after explanation without the need for additional treatment.

Mini-implant dimensions

Three of the mandibular failures had 6mm length bodies, and these were replaced successfully with 9mm body length mini-implants.

Technique factors

Two of the above mandibular replacements involved the use of a cortical bone punch to initially perforate the cortex. This manual bone punch became available in mid-2007 and was used specifically to puncture through dense cortical plate prior to self drilling insertions in the mandible and mid-palate.

Two other mandibular mini-implants failed following insertion by maxillofacial surgeons at the time of third molar removal under general anaesthetic. In this case an insertion stent was not used.

The only maxillary buccal insertion to fail was inserted by the junior member of staff with no previous mini-implant experience.

Two maxillary palatal mini-implants failed on first attempt with a manual insertion technique using a long screwdriver. These were replaced successfully using a guidance stent, a slow handpiece and a short screwdriver adapter to aid insertion given the difficulty in accessing these insertion sites.

CONCLUSION / PLAN

- The overall success rate of 80% met the audit standard.
- Maxillary sites were more successful than mandibular ones, in concordance with the literature.
- Larger mini-implant body dimensions may have better success rates.
- Technique refinements (eg cortical punch usage) and clinical experience are likely to be important factors.

Intervention

- Adequate mini-implant training should be given to every orthodontist / surgeon involved in mini-implant insertions.
- An insertion stent should be available for surgeons and inexperienced orthodontists. It may also be advisable for the adjacent tooth roots to be diverged prior to mini-implant insertion.
- A cortical bone punch is advisable for mandible insertions (due to the dense cortex).
- A speed-reducing handpiece should be used where access is difficult.
- The use of short (6mm body length) mini-implants should be reserved for specific circumstances eg horizontal (rather than oblique) mandibular insertions.

Plan

We plan to re-audit our mini-implant insertions performed in 2008, to assess whether these interventions affect the mini-implant success rate. This is in line with the recommendations recently published by the National Institute of Health and Clinical Excellence¹⁴.

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CONSULTANT SUPERVISION OF ORTHODONTIC SPECIALIST REGISTRAR TRAINING IN TWO SOUTH THAMES TEACHING HOSPITALS

L Holm and S Hirani

INTRODUCTION

Appropriate supervision is important to ensure that high standards of patient care and specialist registrar training are delivered. At the moment there are no national guidelines for acceptable levels of supervision, however the Faculty of Dental Surgery at the Royal College of Surgeons of England has advised that 60% supervision would be a minimum standard.¹ Regional audits carried out in the Mersey region¹ and Eastern region² used a four point scale to quantify consultant supervision (Table 1). This grading system was used to audit the levels of consultant supervision for orthodontic specialist registrars at two teaching hospitals in the South Thames region.

Grade 1	Consultant available in the department with no other commitments
Grade 2	Consultant available in the department but has other commitments
Grade 3	Consultant unavailable in the department but is within the hospital
Grade 4	Consultant unavailable in the department and is outside the hospital

Table 1. Four-point scale of consultant supervision as devised by Scholey and Pender¹

AIMS

- To determine the level of consultant supervision in two teaching hospitals in the South Thames region
- To determine whether patients were seen by the allocated consultant
- To set a standard for the South Thames teaching hospitals

STANDARD

The standard for the audit was a minimum of 60% consultant supervision, as recommended by The Faculty of Dental Surgery at the Royal College of Surgeons of England. The standard set for the Mersey regional audit¹ was also used for comparison (Table 2).

Below 60% Grade 1 or 2	Unsatisfactory
60 to 79% Grade 1 or 2	Satisfactory
Greater than 80% Grade 1 or 2	Excellent

Table 2. Supervision standards set for the Mersey regional audit¹

METHOD

This prospective audit was carried out at two teaching hospitals in the South Thames region. It ran for 4 weeks (6th January 2005- 3rd February 2005) at Site A and for 6 weeks (27th January 2005- 8th March 2005) at Site B. Data collection at the two sites was not exactly coincident and did not continue

for the same length of time due to delays in communication between the sites and the timing of specialist registrars' annual leave. Although consultants had given their consent to the audit at a departmental meeting, they were blinded to the start and finish dates.

DATA COLLECTION

Specialist registrars in years one two and three of the MOrth training programme completed a form for each patient episode during the audit period. The level of supervision for the session was recorded using the four-point scale of consultant supervision (Table 1). In addition, specialist registrars recorded whether or not patients had been seen by the consultant allocated to the session. For those patients who were not seen by the allocated consultant, the reason why was recorded.

RESULTS

A total of 652 forms were completed over the audit period by 20 specialist registrars (12 at site A and 8 at site B). These forms represented 350 patient episodes during 16 clinical sessions at site A and 302 patient episodes during 28 clinical sessions at site B. At Site A, 86.7% of sessions had levels of consultant supervision at grades 1 and 2, compared to 66.2% at Site B (Table 3). Patients were seen by the allocated consultant on 69.1% of occasions at Site A compared to 47.0% of occasions at Site B (Table 4). Of the patients who were not seen by the allocated consultant, some were seen by a consultant who was not allocated to the session (10.8% at site A and 23.8% at site B) and some were not seen by a consultant at all (20.1% at site A and 29.2% at site B).

Site	Grade 1	Grade 2	Grade 3	Grade 4	Grade 1 and 2
A	68.1%	18.6%	1.0%	12.2%	87.6%
B	55.3%	10.9%	2.0%	31.8%	66.2%

Table 3. Results for supervision grade

Site	Yes	No
A	69.1%	30.9%
B	47.0%	53.0%

Table 4. Was the patient seen by the allocated consultant?

DISCUSSION

Both teaching hospitals achieved the gold standard as set by the Faculty of Dental Surgery. Comparison with the standard set by the Mersey region demonstrates that the level of supervision at Site A falls into the 'excellent' category and at Site B it falls into the 'satisfactory' category. Reasons for the level of supervision being Grades 3 or 4 included the consultant having

other commitments within the hospital, or being away on annual leave, sick leave, study leave or maternity leave.

Patients were frequently not seen by the consultant allocated to the session. This was due partly to consultants being away on leave, but some patients were attending for procedures (e.g. placement of separators or routine archwire changes) that did not require the consultant to be present. The level of experience of specialist registrars may also have influenced the percentage of patients being seen by the allocated consultant, the more experienced specialist registrars requesting the consultant to see a smaller proportion of their patients. Occasionally patients were seen by a consultant other than the one allocated to the session. While this was better than the patient not being seen by a consultant at all, it was not ideal as continuity was not maintained.

RECOMMENDATIONS

The minimum level of supervision advised by the Faculty of Dental Surgery is easily achieved. In order to continue to drive up standards, the minimum level of supervision should be revised. On completion of the Eastern region audit, McCarthy suggested the following supervision standards should be adopted² (Table 5).

Less than or equal to 70% grade 1 or 2	Unsatisfactory
70-89% Grade 1 or 2	Satisfactory
Greater than or equal to 90% grade 1 or 2	Excellent

Table 5. Revised supervision standards as suggested by McCarthy²

Another cycle of data collection should be performed to 'close the loop'. At site B additional consultants have been recruited since the audit was carried out, and although this was not as a direct result of the audit, it is anticipated that the level of supervision at this unit will have improved.

CONCLUSIONS

Both South Thames teaching hospitals attained the gold standard as set in the audit, although there was a considerable difference in the level of supervision between the two sites.

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AN AUDIT OF THE STANDARDS AND LEGIBILITY OF ORTHODONTIC CASE NOTES AT THE UNIVERSITY DENTAL HOSPITAL OF MANCHESTER

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BACKGROUND

Case notes are an integral part of the provision of a high quality of patient care. They are the primary means by which information regarding the patient's treatment is recorded.

Within a teaching hospital a patient may be seen by several clinicians. Every clinician involved in a patient's care should keep high quality and contemporaneous clinical records which facilitate the continuity of care and aid resolution of potential medico-legal matters. A well structured, organized and legible approach would prevent confusion and facilitate better overall patient care.¹

AIMS AND OBJECTIVES

- To evaluate the quality, structure and legibility of written hospital records of orthodontic clinicians at the University Dental Hospital of Manchester.
- To identify areas of deficiency of written hospital records.
- Take appropriate action to rectify any deficiencies identified.

STANDARDS

We set 100% compliance with the Gold Standard minimum data set out by:

- British Orthodontic Society, *Orthodontic records collection and management* 1999.²

2. Dental Update, Legibility and clarity of Treatment Records 2000.³
3. Royal College of Surgeons of England, Guidelines for clinicians on Medical Records and Notes.⁴
4. University Dental Hospital of Manchester Record Keeping Guidelines.⁵

Recommendations were the provision of the following information:

- A patient identification sticker on each sheet.
- The date written at the start of each entry.
- A record to show that the patient has been seen by a Consultant.
- An indication of the next visit time interval.
- An indication of a next visit plan.
- The entry to be signed by the clinician.
- The name of the clinician printed besides the signature.
- An indication of the grade of clinician.
- Legible records

MATERIALS AND METHOD

This was a retrospective audit looking at entries made by orthodontic clinicians at the University Dental Hospital of Manchester.

The sample consisted of 13 clinicians: 2 consultant orthodontists, 3 FTTAs and 8 SpRs.

Five case notes were randomly selected for each of the 13 orthodontic clinicians at the University Dental Hospital of Manchester. For each of the case notes, the first entry made in December 2005, February 2006 and April 2006 were analysed. In total the sample size consisted of 195 entries (i.e. 13 x 5 x 3 = 195), 15 per clinician.

The data was collected and recorded on to a computerised data collection sheet by the same examiner.

Three designated examiners also assessed the legibility of all case notes: A consultant orthodontist, a senior house officer and a senior orthodontic dental nurse. A grade of "good", "moderate" or "poor" was provided per case note entry.

Feature Operator (grade)	ID Sticker	Date	Consultant's supervision recorded	N/V Time Interval	N/V Plan	Signed	Printed name	Grade of operator	OVERALL %
1 (CONSULTANT)	100	100	N/A	0	7	100	7	0	44.86
2 (CONSULTANT)	100	100	N/A	13	40	100	0	0	50.43
3 (FTTA)	100	100	0	0	27	100	0	0	40.88
4 (FTTA)	100	100	13	33	53	93	93	73	69.75
5 (SpR.)	100	100	0	20	100	87	0	0	50.88
6 (SpR)	100	100	53	0	100	80	80	93	75.75
7 (SpR)	100	100	27	20	80	100	80	0	63.38
8 (SpR)	60	100	60	93	33	100	80	0	65.75
9 (SpR)	80	100	27	7	87	100	7	0	51.00
10 (SpR)	87	100	7	0	80	93	0	0	45.88
11 (SpR)	93	93	73	40	87	87	87	87	80.88
12 (SpR)	100	100	13	0	40	93	73	0	52.38
13 (SpR)	93	100	13	7	27	100	13	0	44.13
TOTAL %	93.31	99.46	34.85	23	58.54	94.85	40	19.46	56.97

Table 1. Clinicians' compliance with gold standard criteria for record keeping (%)

RESULTS

A total of 195 case note entries were assessed. The results are shown below:

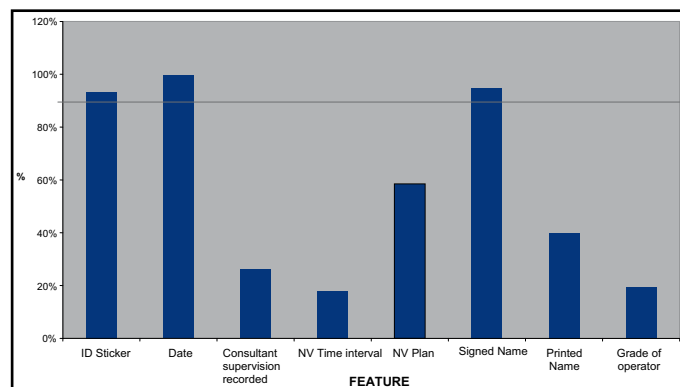


Figure 1. Overall compliance with gold standard.

A high level of compliance was demonstrated in placing the ID stickers (93%), writing the date (194 of 195 entries) and signing the notes (95%). Less than a half (75 of 195 entries) had a printed name of the clinician beside the signature. A legible signature in a printed form was included as a printed name. An even smaller percentage of entries included the grade of the clinician (19%). A moderate proportion (60%) of notes had a plan recorded for treatment on the following visit, but less than a quarter (23%) of clinicians had identified the interval until this next visit. One clinician was only 7% compliant. Only a third of junior staff documented their supervision and advice from a consultant (35%). Figure 1 shows the level of experience does not influence overall compliance with the gold standard criteria. The overall legibility of the case notes was acceptable with 96% being rated either good or moderate by the 3 assessors. 4% were rated as poor legibility.

DISCUSSION

The results show that out of the sample of 195 case-note entries made by the orthodontic clinicians, only an overall compliance of 57% was met. A clinician's individual compliance appeared to be unrelated to the level of grade. It is important to note that the clinician with the greatest compliance was still 20% less compliant than the gold standard set out to be 100%. Four clinicians were less than 50% compliant.

The features which were particularly poorly recorded were:

1. Printed name (40%)
2. An indication of a consultant view (26%)
3. Next visit time interval (23%)
4. Grade of clinician (19%)

Printing of a clinician's name is of paramount importance as an individual's signature is often illegible and the only methods of determining who has treated the patient is by the printing of a name. Compliance was sub standard in several areas of record keeping. Reasons for this can be due to:

1. Time pressures
2. Lack of training
3. Lack of compliance with standard protocols.
4. Lack of knowledge

Suggested ways of addressing these:

1. Delegation:
 - a) Dental nurse involvement in

placing ID Sticker on every sheet

b) Dental nurse involvement in writing date

2. Training as part of Trust (or employment) induction on good record keeping standards

3. Provision of stamps with printed name and grade

CONCLUSION

This audit highlights deficiencies in record keeping which may have an impact on quality of service provision and lead to medico-legal pitfalls. The main areas of deficiency impacted identification of the treating clinicians where names and grades were not printed as well as evidence of seeking consultant

supervision and the time interval until the next appointment.

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ORTHODONTIC EDUCATION CLINICS – AN AUDIT ON ORAL HYGIENE AND DENTAL KNOWLEDGE.

N.Arkutu, J.M.Scholey and A.Curly

INTRODUCTION

The Orthodontic Education Clinics began in June 2004. Patients are referred to these nurse-led clinics following initial consultation, assessment and treatment planning by the consultant orthodontists. At the first clinic appointment (approximately 45 minutes in duration) an in-depth oral health assessment is carried out to establish the patient's motivation and suitability for treatment.

The patient is allowed up to three visits to achieve an acceptable plaque score. Only then will the patient's name be entered on the treatment waiting list. If a patient fails to attend for any of the clinics then the referring consultant is notified and can decide whether further appointments will be sent.

A number of studies have examined the effects of orthodontic education clinics on oral hygiene in treatment with varying results¹ being reported. But few have documented the effect on the patient's knowledge and dental-health awareness in relation to orthodontics – and this is also a key objective of orthodontic education clinics. The dental health information which is given is based on the Scientific Basis of Oral Health Education² and the four key messages namely dietary advice, tooth brushing, dental attendance and the use of Fluoride.

AIMS

To audit the effectiveness of orthodontic education clinics both in terms of oral hygiene status achieved and dental health information gained.

STANDARDS

Oral hygiene – All patients should achieve a plaque score of 15% or less¹ within three visits to the orthodontic education clinic.

Dental Health Information – 80%. This was arbitrarily chosen as a mark of comprehension and recall.

MATERIALS AND METHODS

After the initial consultation and assessment, any patient who wishes to take up the offer of treatment within University Hospital North Staffordshire is required to attend the orthodontic education clinic. At the first visit disclosing agents are applied to the teeth and the plaque distribution and score is calculated (O'Leary's plaque score – 1972³) and recorded on the scoring index chart. A gentle scrub technique (Modified Bass Technique) and the use of inter - dental aids are demonstrated. A display board (which is regularly changed) is set-up in the waiting room to reach a larger target audience.

Competitively priced oral health products are sold within the department. Dietary advice is also given. Demonstration models of various orthodontic appliances are shown – and especially those prescribed as part of the patient's treatment plan (e.g. Twinblocks and Harvolds functional appliances, fixed appliances, headgear, rapid maxillary expansion and retainers).

The probable progress of treatment and its likely length is discussed, with information being provided about the proposed appliances, the reason for their use and the need for excellent compliance. The risks and benefits of treatment are explained with photographic examples being shown to illustrate these. The working hours of the department are made clear and the need for regular attendance (in the department and also to the GDP) is stressed. There is an opportunity for questions to be asked.

The patient (or the parent where applicable) is asked to sign a list of the points covered during the orthodontic education sessions which is kept within the patient's clinical notes.

A questionnaire was devised to assess uptake of information given on the orthodontic education visit clinic and completed by 50 consecutive patients.

RESULTS

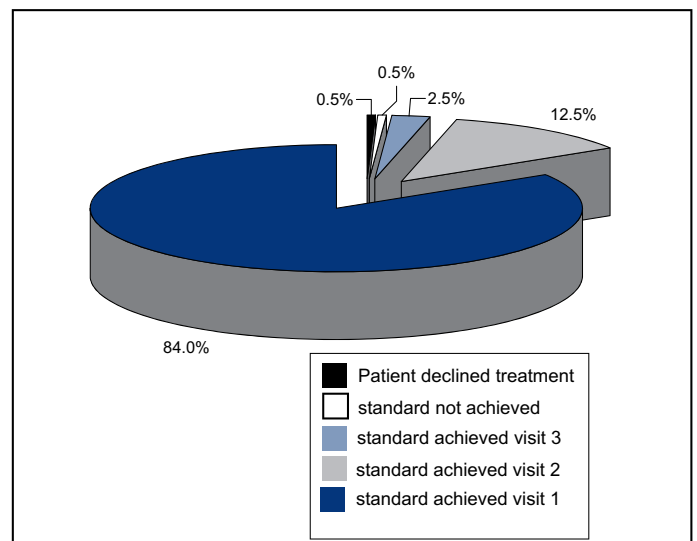


Figure 1. Outcome of Orthodontic Education Clinics

Of the 407 patients seen since 2004, only 2 (i.e. 0.5%) have failed to achieve the set standard in three visits and were therefore discharged. A further 2 patients decided against treatment having realised how much effort would be involved.

12.5% needed two visits and 2.5% needed a third visit to achieve a plaque score of less than 15%. Any patient who, after three visits to the clinics, still fails to demonstrate an adequate standard of plaque control, will be discharged and will not normally be accepted in the department following any later re-referral.

The biggest reduction in plaque score achieved was from 64% to 3%.⁴ 15% of patients did not attend the first appointment and were re contacted. It is unclear how many of these appointments were genuine DNA's because the hospital was changing over to a centralised booking system at the time.

This information is of use in planning the manpower requirements and setting up a business case for orthodontic education clinics.

Knowledge and Understanding of Oral Health

The questionnaire incorporated multiple choice and short answers which have been summarised below.

Question	Correct	Wrong	Audit Standard Achieved
While you are wearing your brace, do you know how often you need to brush your teeth?	82%	18%	Yes
In the clinic you were shown a photograph of "white marks on teeth" — called decalcification. Which of the following may take part in the causing this?	98%	2%	Yes
While braces are on, how often should you attend your own dentist?	98%	2%	Yes
You were shown how to clean between your teeth and under the wire of your brace. Do you use any special brushes to help you do this?	80%	20%	Yes
How often do you disclose your teeth?	74%	26%	No
Do you understand how diet can affect your dental health? Please give examples.	98%	2%	Yes
You were given some leaflets, and shown some visual aids. Have you read these and did you find them to be of a satisfactory quality?	92%	8%	Yes
How informative overall did you find the orthodontic education clinic?	96%	4%	Yes
How happy were you with the wait for your oral health education appointment?	82%	18%	Yes

Table 1. Knowledge and Understanding of Oral Health

In relation to the importance of diet and its effect on dental health, whilst 98% knew that diet affected dental health and that hard foods could damage the appliance, only 42% specified fizzy drinks as contributing to decalcification. Our nurses have been informed of this and encouraged to emphasise this point.

DISCUSSION

This audit showed that patients found the orthodontic education visit clinics very valuable, and picked up knowledge that will serve to improve their dental health in the long term. 82% found the clinic to be very informative and a further 14% fairly informative. The majority of patients needed just one appointment to achieve the required standard and were

retaining the information up to 20 months after the event.

A large reduction in plaque score is possible as illustrated by one change from 64% to 3%. This shows that, despite initial poor levels of oral hygiene even the most problematic of patients can often achieve the standard, if given the right instruction, time and encouragement. "Need assessment" is now an important consideration in orthodontics. But figures have sometimes been skewed by the rejection of patients (whose malocclusions should have qualified for treatment) because of inadequate oral hygiene. It is certainly true that orthodontic treatment is inappropriate if oral hygiene is poor but patients ought only to be denied treatment if they show themselves incapable of improving their care to an acceptable standard. The situation is similar to that in which certain surgery may be denied to an obese patient or to a smoker. Further care would not be denied if such a patient loses weight or gives up smoking because the risk factors have been resolved.

Whilst the clinicians find the wait for Orthodontic Education Clinics too long, approximately 5 months in duration, 60% of the patients found the wait acceptable with only 18% finding the wait too long.

CONCLUSION

This audit provides an indication of the number of dental health clinics that a patient needs to achieve an O'Leary Plaque Index of less than 15%, and shows that, as well as producing an improvement in oral hygiene, these clinics serve as a means of increasing patients' levels of informed consent. The areas needing improvement i.e. the relationship between fizzy drinks and decalcification have been highlighted. The orthodontic education clinic will be re audited in six months time as part of the on going audit into this service, which gives all patients the opportunity to improve their dental health and to test compliance with attendance etc. prior to embarking on active orthodontic treatment.

A useful follow up audit will involve writing to local dentists and asking if they could provide the same education within their practices.

ACKNOWLEDGEMENTS

We would like to acknowledge the efforts of Anita Curley – (Dental Nurse) in setting up these clinics and to congratulate her upon being awarded the TOC Dental Nurse Prize (2005 and 2007) for her papers based on this work.

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A RE-AUDIT OF THE USE OF FLUORIDE MOUTHWASH IN ORTHODONTIC PATIENTS

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INTRODUCTION

White spot lesions following fixed appliance treatment has been found to occur in 50 % of patients¹ and can significantly affect the final treatment aesthetics. A Cochrane review² of 15 trials and 723 participants concluded that there was some evidence that daily fluoride mouthwash reduces the severity and occurrence of white spot lesions in patients wearing fixed appliances. Although compliance is very difficult to measure, one study³ found that only 42% of patients used fluoride mouthwash at least every other day and those that complied least had more white spots after treatment.

Based on the best practice from other areas of dentistry⁴ a 0.05% sodium fluoride mouthwash is commonly recommended. The mouthwash that is dispensed at St Luke's Hospital, Bradford is a 100ml bottle of 2% sodium fluoride, which is then diluted by the patient to 0.05%. This 100ml bottle contains 900mg of fluoride ion and the lethal dose has been estimated at between 71-142mg/Kg⁵ or as low as 32-60mg/Kg⁶. Fatalities in children have been reported at doses as little as 16mg/Kg⁶. At this dose, an average 17Kg 4 year old child, need only consume approximately 30mls of the concentrated mouthwash to receive a potentially lethal dose.

A previous audit completed in 2000, by H. H. Goh in the same unit, found that, of 72 respondents, 72% of patients claimed to use fluoride mouthwash with 67% claiming to use it daily. 61% claimed to have had additional encouragement from orthodontic staff and 53% claimed to have been given warnings about accidental overdose.

Recommendations from the previous audit were as follows;

- Clear explanation should be given at the time of issue. An instruction sheet may be helpful
- Patients should be checked and encouraged at regular intervals
- "Dangers" of its use/abuse need to be reinforced. This could be included in the instruction sheet
- Waiting room information on the use and safety of fluoride mouthwash could be considered

The current practice in the orthodontic department in Bradford is for the orthodontic staff to give verbal advice on the correct use and the dangers of accidental overdose. There is currently no written information given to patients about accidental overdose. A leaflet about fluoride mouthwash dosage is given to the patient at the discretion of the clinician, although dosage instructions are present on the mouthwash bottle.

AIMS

- To assess whether patients know how frequently they should use fluoride mouthwash.
- To determine whether patients feel they have had appropriate advice and encouragement with regard to use and dangers of fluoride mouthwash.
- To identify patient compliance with fluoride mouthwash.

STANDARDS

The consultant staff of the department agreed on the standards for this audit. These were based on the most achievable and are as below:

- 100% were given fluoride mouthwash

- 95% use fluoride mouthwash
- 95% use it daily
- 100% have had additional encouragement by orthodontic staff
- 100% received advice about overdose

METHOD

The audit included all patients attending fixed appliance appointments at St Luke's Hospital, Bradford over a three month period, from July 2nd 2007 to October 2nd 2007. Each patient was given an anonymous questionnaire at the end of the treatment session by the nursing staff. The patients completed the questionnaire in the waiting room and placed the questionnaire themselves in a tray at reception. To avoid patients submitting more than one questionnaire, a hospital number was recorded at the top of each questionnaire. Data collection was completed in a single blinded manner.

The first cycle of the audit, completed in 2000, had the same methodology as the second cycle. The only difference was that the questionnaire format was updated to encourage a greater number of respondents and to include a question asked whether "the patient received mouthwash".

RESULTS

Two hundred and ten questionnaires were completed. Four were found to be duplicates These were excluded giving a total of 206 respondents.

Standard	2000 Audit	2007 Audit
100% given mouthwash	N/A	97.1%
95% use mouthwash	72%	91.7%
95% use mouthwash daily	67%	76.7%
100% encouragement	61%	67%
100% advice about overdose	53%	59.7%

Table 1. Overall result to show if audit standards were met

It must be noted that, although only 59.7% of patients agreed to receiving advice about accidental overdose, only 18% disagreed. 18.4% did not know whether they received advice and 3.9% did not respond.

Table 1 demonstrates if the results met the audit standards. In relation to the first of the aims, 90.8% of patients confirmed to have received instructions about the mouthwash when they were given it, with 3.9% not confirming this. The remaining 5.4% of patients either did not know whether they received instructions or did not respond to the question.

76.7% of patients claimed to use their mouthwash daily (once or twice), with 14.6% of these patients using it twice a day. This left 62.1% of patients who claimed to use their mouthwash once a day, although only 58.3% of patients thought that they should.

82% of patients received instructions about their mouthwash from the orthodontist, 29.6% from the nurse and 21.4% from the pharmacist. Only 2.9% of patients claimed to have received no instructions.

It must be noted that, although only 59.7% of patients agreed to receiving advice about accidental overdose, only 18% disagreed. 18.4% did not know whether they received advice and 3.9% did not respond.

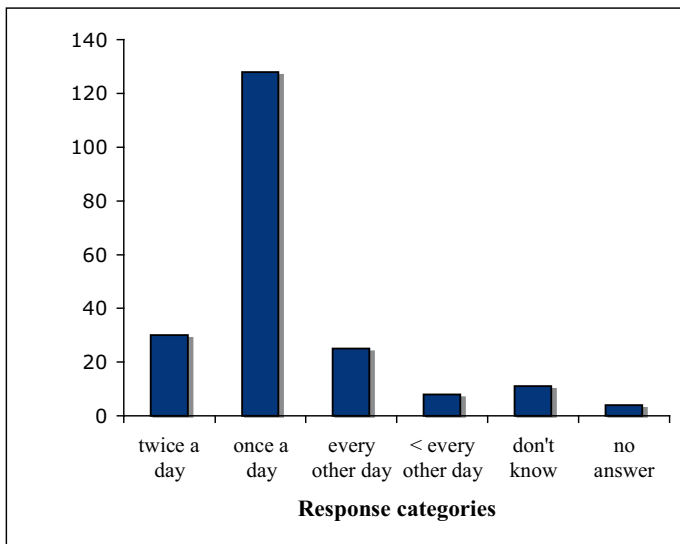


Figure 1. Response to the question. "I use my mouthwash..."

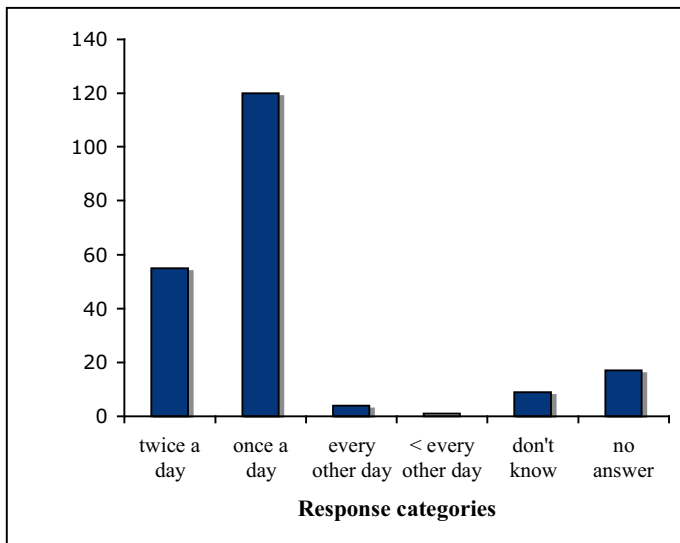


Figure 2. Response to the question. "I think I should use my mouthwash..."

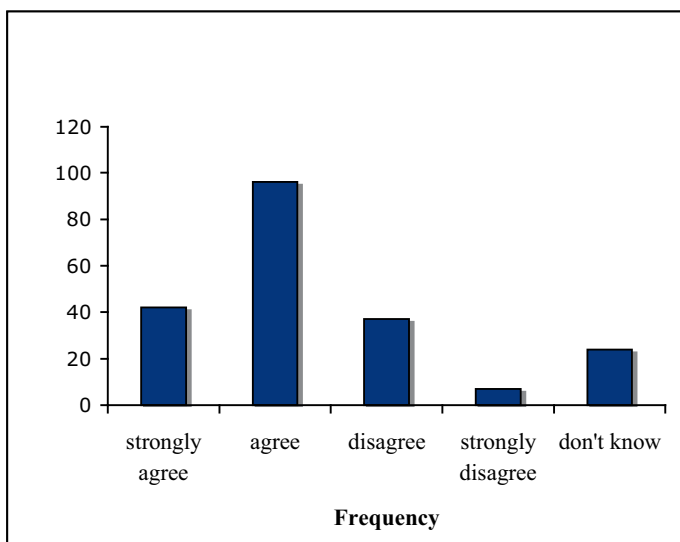


Figure 3. Response to the statement. "I get encouragement about using the mouthwash from orthodontic staff..."

67% of patients either strongly agreed or agreed to receiving encouragement from orthodontic staff. This included both the clinician and the nurse.

DISCUSSION

None of the standards set were met, with the most disappointing results in relation to patients receiving encouragement from orthodontic staff (67%) and receiving

warnings about accidental overdose (59.7%). Compared to the audit completed in 2000 there was an improvement in all areas with the most notable being that 91.7% of patients compared to 72% claimed to use their fluoride mouthwash. This may be due to the increased encouragement from orthodontic staff, different demographics of the two samples or merely a reflection of increased health awareness. The standards set were high compared to the results from the previous audit, but it was felt that the percentages set were in line with best practice. Although the orthodontist has the prime responsibility for giving information to the patient it was disappointing to find that only around 30% of patients felt that they received information from nursing staff. With regard to this sample of patients, some would have attended a nurse led clinic, prior to placement of fixed appliances and some would not. This is at the discretion of the orthodontist and will certainly have introduced bias into the results.

The failure to meet the set standards, may in part be due to the previous recommendations not being enforced and in particular a lack of written information with regard to overdose.

It must be remembered with regard to the results, that the accuracy of them is reliant on patient memory and honesty which introduces recall bias into the results. It must also be noted that, when comparing the current results with the 2000 audit, the present audit had a far higher number of respondents.

CONCLUSION

This audit shows that around one third of patients in the department are not clear on how often they should use fluoride mouthwash and one third do not feel that they get encouragement from orthodontic staff. In addition, around 40% of patients could not confirm to have received warnings about accidental overdose.

RECOMMENDATIONS

- Written information, in addition to verbal, will be given to all patients when fixed appliances are placed. The information sheet will include dosage information in addition to warnings about overdose and misuse.
- Encouragement should be given to the patient at each subsequent appointment with regard to use of fluoride mouthwash.
- Nursing staff should be encouraged to reinforce the information given by the orthodontist.

The recommendations will be implemented and the third cycle of the audit will be completed in one years time.

ACKNOWLEDGEMENTS

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

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REGIONAL AUDIT OF EXTRACTION LETTERS: DO WE COMPLY WITH BOS GUIDELINES?

Rachael E Benson, Mhairi R Walker and Jayne E Harrison Mersey Deanery

INTRODUCTION

Incorrect extractions are the commonest reason for legal action in connection with orthodontic treatment¹. An analysis by the Dental Defence Union (DDU) found 143 complaints, over 10 years, about treatment to the wrong tooth within UK dentistry, including orthodontics, of which 83% were extractions². In 2004, Rupert Hoppenbrouwers, head of the DDU, stated:

“Wrong tooth errors usually occur as a result of poor communication within a dental practice or between dentists in different practices. For example, when an orthodontist has requested extractions by the patient’s general dental practitioner and the GDP misinterprets the request, is unable to read the handwriting, or the instruction is incorrect.... Whatever the reason, the overwhelming majority of these errors could have been prevented if established patient checking procedures and protocols were followed consistently.”

It is increasingly likely that, in cases of medical negligence, the courts will turn to authoritative clinical guidelines as the gold standard for appropriate patient care³. In 2001, the British Orthodontic Society (BOS) produced an advice sheet entitled ‘Orthodontic Extractions Risk Management Guidelines’, in order to minimise the chances of an error being made when a patient is referred for extractions¹.

AIMS

To assess whether extraction letters, sent from seven hospital orthodontic departments, within the Mersey deanery, comply with BOS guidelines.

AUDIT STANDARD

The gold standard was based on the BOS Advice Sheet 12: Orthodontic Extractions, Risk Management Guidelines¹.

A gold standard extraction referral letter should include the following:

- Patient’s name
- Patient’s date of birth
- Patient’s address
- Date
- Brief outline of treatment
- Timing of the extraction
- Relevant medical history
- Extraction(s) requested in words (long-hand)
- Extraction(s) requested in dental notation (Palmer, FDI)
- Extraction(s) requested match the case notes

Each point was equally weighted. The target was that 90% of letters sent from each department should have 100% compliance with the gold standard (i.e. score 10/10).

METHOD

The first stage of the audit involved a retrospective analysis of the last ten extraction referral letters written by each Consultant, FTTA and SpR at two of the seven units. This allowed testing of the audit methodology and development of the data sheet and compliance scoring system. The results were presented at a regional audit meeting in October 2007 prior to dissemination of the audit to the other regional units, and the methodology was accepted without changes.

The method involved collecting the last ten extraction referral letters written by each clinician, from the computer records of the respective secretaries using standard search phrases in MS Word search tool. Letters were selected prior to October 2007, so that presentation of the preliminary results would not influence letter style. The patient’s case notes were obtained and the letter was then marked against the gold standard to give a score out of 10.

Ten per cent of letters were re-analysed, at least 1 month later, in order to assess intra-examiner reliability.

Data were analysed using SPSS for Windows version 12 (SPSS, Inc., Chicago, IL, USA) and presented using descriptive statistics.

RESULTS

Twenty-three members of staff were audited at seven regional units. Four clinicians were audited at more than one unit. Ten letters were collected for each clinician, except in three cases when it was not possible to find 10 letters on record. 267 letters were analysed from a potential total of 280 (see Table 1).

UNIT	NUMBER OF STAFF	NUMBER OF LETTERS
1	15	144
2	2	16
3	2	20
4	1	10
5	2	20
6	2	20
7	4	37
	Total 28	Total 267

Table 1: Number of clinicians and letters audited

All letters were sent prior to the October 2007. 79% of letters were sent between 2006 and 2007 (see figure 1).

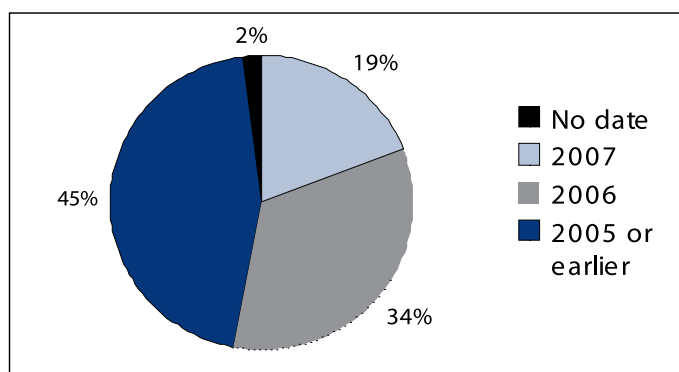


Figure 1: Date of extraction referral letters

The reliability of the scoring was 100%. The patient’s name, date of birth and address were included in all letters. The date was included in 99.6% of letters (n=263).

The relevant medical history was included in 96.2% of letters (n=257): it was included 100% of the time in letters sent from clinicians at units 2-6. There was no up-to-date medical history in the case notes in 3 patients at unit 1 (2.1%) and 5 at unit 7 (13.6%).

Five units (units 2-6) included a brief outline of treatment 100% of the time, but this was included less often at unit 7 (92%) and unit 1 (69.4%). The required timing of the extraction(s) was indicated in all letters from units 2-7, and in

90.3% of the letters from unit 1 (n=130/144).

Requesting the extraction(s) in both dental notation (Palmer, FDI or for example UR4) and words was carried out well at units 2, 5 and 6 (see Figure 2). In general the request was made in dental notation more commonly than words. At units 1, 3 and 4 the request was made in words in 50% or less of letters.

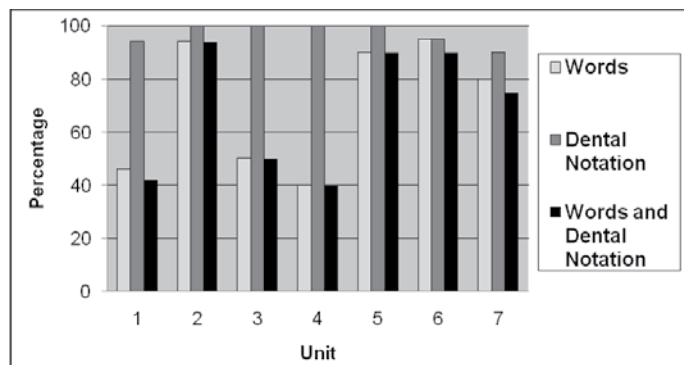


Figure 2: Notation used to request extraction(s)

In 98.1% of letters, the extraction request matched the treatment plan in the case notes. However, they did not match in 2.1% (n=3) letters from unit 1 and 5.4% (n=2) letters from unit 7. In these five cases the extraction was requested using one notation only.

A summary of the overall compliance with the points of the gold standard is given in Figure 3.

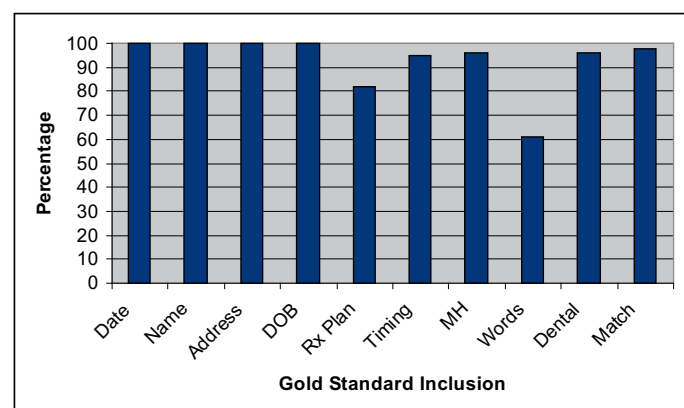


Figure 3: Overall compliance with the gold standard.

DISCUSSION

Units 2, 5 and 6 met the target of at least 90% of letters scoring 10 out of 10. The target was not met at units 1,3,4 and 7.

However, it is worth noting that units 3 and 4 scored at least 9 out of 10 in all letters sent (see Table 2). Other than the clinician's personal preference in letter writing, it is unclear why some units did better than others. However, there were fifteen operators audited at unit 1 and four at unit 7, which may account for why these units fared poorest.

One of the greatest omissions was not requesting the extraction in both dental notation and words, particularly words in long-hand. Clinicians may feel that as long as they use one notation, checked against the treatment plan in the case notes, there will be no ambiguity or mistakes. However, the BOS and DDU recommend that the extraction should be requested in dental notation and words in order to avoid wrong- tooth errors. These suggestions are only guidance, but do seem to make sense given that all five cases, in which the extraction request in the letter was incorrect in this audit, involved the use of one notation only. Fortunately, in all these cases the wrong tooth was not extracted but there was potential for a wrong tooth error.

Secretaries type all the letters sent from the units involved in this audit, so legibility was not included as a gold standard point. If this audit were to be carried out in a unit where hand-written letters were sent the gold standard and methodology should be modified accordingly. It becomes of even greater importance that extractions are requested in two notations when the letter is hand-written to avoid errors in interpreting handwriting styles.

Unit	Number Of Letters	Letters scoring 10/10	Letters scoring at least 9/10	Target Met?
1	144	28%	70%	NO
2	16	94%	100%	YES
3	20	50%	100%	NO
4	10	40%	100%	NO
5	20	90%	100%	YES
6	20	90%	100%	YES
7	37	54%	92%	NO

Table 2: Compliance with the target at each unit.

CONCLUSIONS

Three of the seven units audited met the target set. However, there is room for improvement, particularly at the other four units. At two units, some potentially serious omissions or mistakes were made, albeit in a small number of letters, highlighting the need for consistent, accurate inclusion of all the gold standard points. The extraction(s) requested should be written in both words and dental notation and this should be checked against the case notes prior to sending the letter.

RECOMMENDATIONS

The results of this audit have been presented at two regional audit meetings. At these meetings all clinicians re-appraised themselves with the BOS Advice sheet 12: Orthodontic Extractions, Risk Management Guidelines, and the following recommendations were made:

- All new SpRs to be made aware of the BOS guidelines when starting their post
- All clinicians should have access to the guidelines
- Secretaries in the units to be made aware of the audit findings

When writing an extraction request referral letter:

- Write the extraction request in both words and dental notation
- Refer to the treatment plan in the case notes when signing the letter
- Include a brief outline of the treatment planned
- Include any relevant medical history details

It is planned to re-audit all units in 12 months' time following these recommendations. This will involve auditing letters sent after October 2008 against the same gold standard and target.

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FACTORS INFLUENCING THE DURATION OF ORTHODONTIC TREATMENT

I.R. Edwards, D.J. Spary, Queen's Hospital, Burton-upon-Trent

INTRODUCTION

The duration of orthodontic treatment is influenced by patient characteristics and clinical decisions and is of interest to all involved¹. The concern about the length of treatment will depend on the vested interest of the individual. Patients want orthodontic treatment to inconvenience them as little as possible and one of the first questions the orthodontist is commonly faced with is: "How long will I have to wear braces for?"^{2,3} Parents want what is best for their child but in the quickest possible time, so that the impact on lifestyle is minimised. During the consent process, risk factors of orthodontic treatment will be discussed. Individuals consenting to orthodontic treatment will want to minimise the time during which potential harm, such as root resorption and decalcification, may occur.

Clinicians are under pressure to keep treatments brief in order to prevent compliance "burnout". The recent introduction of the 18-week-wait has placed greater demands on shorter treatments. Healthcare purchasers and providers desire a high turnover of patients and a service that is efficient and economically successful¹. Estimates of treatment duration are generally purely subjective and are almost entirely made on the basis of clinical experience⁴. However, estimates of treatment duration are fraught with difficulty and involve a whole myriad of factors. Shia described 18 factors that increased treatment time in his own practice and ascribed patient cooperation and broken appointments as the most important factors contributing towards extended treatment times⁵.

AIMS

- To determine the duration of orthodontic treatment at Queen's Hospital, Burton-upon-Trent
- To identify factors complicating the length of treatment time

STANDARDS

The reported average treatment times are:

Turbill et al. (2001) 15.7 months¹ *

Richmond and Roberts (1993) 1.9 years (over 50% of cases treated with removable appliances)⁶ *

Fink and Smith (1992) 23.1 months⁴ **

Skidmore et al. (2006) 23.5 months (two phase treatments excluded from their study)² ***

Grewe and Hermanson (1973) 24.3 months⁷ ****

Beckwith et al., (1999) 28.6 months³ **

Vig et al. (1990) 31.2 months⁸ **

* Cases derived from the General Dental Services funded by the National Health Service

** Cases derived from private practice in the United States of America

*** Cases derived from a single orthodontic practice in an affluent part of New Zealand

**** Cases derived from a University teaching hospital, United States of America

Of the few studies reported on orthodontic treatment duration, comparison is difficult because of the different inclusion criteria set by each study and the number of variables assessed. It is therefore hoped that this study will form a basis for future comparison.

METHOD

Treatment duration, appliance breakages and broken appointments were recorded for 200 consecutively discharged

patients. Treatment duration was defined as the time in months from initial placement of any orthodontic appliance until their complete removal. The average treatment time was calculated for the sample. Reasons why treatment time deviated from the average was considered to be of the greatest interest and so patients recorded as more than standard deviation from the average were further analysed to depict the reasons for shorter or longer treatment. A Peer Assessment Rating (PAR) score was also analysed for these patients. All patients were included in the study unless they had received orthognathic surgery, had cleft lip and/or palate or where initial treatment had been started by the General Dental Practitioner.

RESULTS

- Arithmetic average treatment time for the sample was 20.8 months (+/- 9.57). The median treatment time was 20 months. Treatment duration for the entire sample is presented in figure 1.

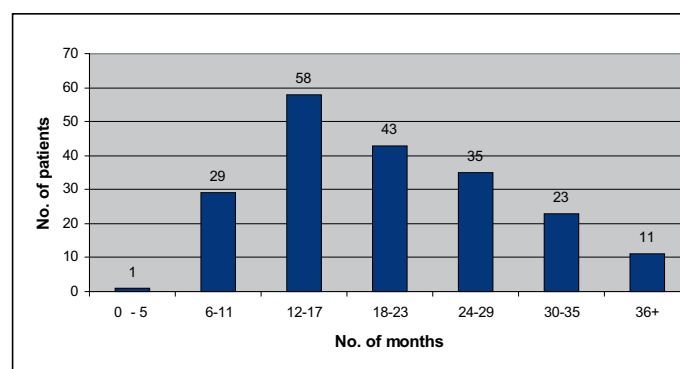


Figure 1. Duration of orthodontic treatment

- Treatment time more than one standard deviation (+/- 9.57) than the average (20.8 months) was calculated as 11 months or less and 31 months and greater (table 1).

	Short treatment time 11 months or less treatment	Average treatment time 12-30 months	Extended treatment time 31 months or greater
No. of patients	29/200	140/200	30/200
Appliance breakages per patient	0.55	1.1	1.77
Broken appointments per patient	0.72	0.67	3.4
Average PAR start	33.36	-	42.34
Average PAR finish	3.4	-	5.59
PAR % Reduction	90%	-	87%
Non- extraction treatment	48%	-	16%
Extraction treatment	52%	-	84%
Poor elastic wear	2/29	-	11/31
Early debond due to poor OH	3/29	-	0/31
Two phase treatment	2/29	-	9/31

Table 1. Data of differences between patient groups

- 30 patients out of the 200 patient sample had orthodontic treatment which lasted 31 months or more. This group of patients was approximately 60% more likely to break their appliance than the average patient. On average this group of patients was more than five times more likely to miss or cancel an appointment compared with the average patient.
- 30 patients out of the 200 patient sample received orthodontic treatment which took 11 months or less. This group of patients was 50% less likely to break their appliance than the average patient.
- Patients in the extended treatment time group had greater start PAR scores and were more likely to be treated by extractions.
- Approximately one third of the extended treatment time

group were identified as having poor elastic wear, whilst two patients in the short treatment group were debonded early because of refusal to wear intermaxillary elastics.

- Three patients in the short treatment group were debonded early because of poor oral hygiene.
- Two-phase treatment resulted in longer treatment.

DISCUSSION

When orthodontists quote an estimate of what they believe to be a realistic treatment time this is often made on the assumption that no problems will be encountered before the removal of the appliance. Unfortunately, this guesstimate does not reflect reality because of factors outside the control of the clinician. Patient cooperation is undoubtedly one of the major determinants for successful orthodontic treatment. Fink and Smith, (1992) attributed the variable of “broken appointments” as a measure of overall patient compliance. In concordance with studies by Fink and Smith (1992) and Beckwith et al (1999) this study found broken appointments to be one of the most significant reasons for extended treatment times. Patients who break appointments often have increased periods of time between appointments and re-appointing can often be difficult where clinics are fully booked weeks in advance.

Beckwith et al. (1999) reported that appliance breakages were the second greatest contributor to extended treatment times and in this study contributed significantly. Appliance breakages were more numerous with lengthier treatments. Appliance breakages are a common source of irritation, inhibiting treatment progress whilst damages are repaired. Carelessness and lack of discipline when following instructions may not only result in a compromised outcome but also slow down treatment. In this study poor compliance with intermaxillary elastics was identified as contributing towards increased treatment times. However, a small number of patients were debonded early because they were unwilling to wear class II elastics.

One of the major difficulties in predicting the duration of orthodontic treatment is that patient compliance cannot be reliably assessed until treatment is commenced. Since patient cooperation and motivation are critical we must educate patients thoroughly before embarking upon our prescribed treatment. Patients should know exactly what is expected of them. This is particularly important for elastic wear. We should demonstrate the use of elastics on models and include patients’ agreement to wear elastics and change them, during the consent process.

Despite patient compliance being a major contributor in determining treatment time there are many other variables which need to be taken into consideration. It may be simply that the individual malocclusion is complex and requires longer treatment. In this study greater initial PAR scores at the start of treatment resulted in lengthier treatment. Turbill et al. (2001), also reported longer treatment associated with higher start PAR

scores and additionally found patients with scores of 5 assessed by the Dental Health Component of the Index of Treatment Need took 2 months longer to treat than cases graded 4 or less. Two phase treatments had extended treatment times. This study supports the findings of Beckwith et al. (1999) and Turbill et al. (2001) who found two or more phases resulted in 8 months and 6 months longer treatment respectively. Treatment that involved extractions also had increased treatment time. This is in agreement with the majority of previous studies which also confirm that the greater the number of units extracted the longer the treatment generally takes ^{1, 2, 4, 8, 9}.

CONCLUSION

Orthodontists quote an estimate of treatment time based on the assumption that no problems will be encountered. This study shows that the main problems for extended treatment times are:

1. Broken appointments
2. Appliance breakages
3. Poor compliance with intermaxillary elastics
4. High start PAR scores
5. Extraction treatments
6. Two-phase treatments

Prior to commencing orthodontic treatment, factors within the control of the patient including, attendance for appointments, avoidance of appliance breakages and compliance to follow instructions such as with intermaxillary elastics, must be thoroughly explained and demonstrated. This is essential to minimise the duration of orthodontic treatment and maximise the success of the outcome.

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AN AUDIT ON THE QUALITY OF STUDY MODELS

Thushala Ubaya-Narayanage, J Richard Pilley (Ayr Hospital, Scotland)

INTRODUCTION

Study models are a fundamental element to the successful management of an orthodontic patient. They are a vital tool in diagnosis and treatment planning and in the measurement of treatment progress and outcomes. Preparing ideal study models is not easy and many hurdles stand between the dentition and a first class study model. These include :

- using a well fitting impression tray

- using alginate which has been well mixed but with sufficient working time left before initial set
- managing a patient who maybe is anxious about the whole process
- labelling impressions correctly
- storage and transportation of alginate impressions en route to the lab
- mixing and pouring plaster accurately

- casting, trimming and labelling the models accurately
- carefully removing the impression tray to preserve the fine details of the model

Following discussions between orthodontic clinical staff, an audit was developed to investigate the quality of study models produced by a commercial laboratory for orthodontic cases at a District General Hospital

Transportation of Impressions to the Commercial Laboratory
The alginate impressions were placed in a cold sterilisation bath for ten minutes before being wrapped in damp gauze and sealed in air-tight plastic bags that were labelled with the patient's details. This bag was then placed in a rigid plastic container which was then posted to the commercial laboratory. There was a three-day delay in between impression taking and the casting up process thus the necessity for damp gauze to maintain the integrity and dimensional stability of the alginate impressions. Once the study models were obtained, they were individually wrapped in bubble-wrap sheets and posted back to our orthodontic department.

AIMS

To assess the quality of study models supplied by a commercial laboratory for the orthodontic Registrar in training at a district general hospital in Scotland between August 2007 to July 2008.

STANDARD

A gold standard for quality of study models was agreed upon by the consultants within the orthodontic department with input from the in house technicians. 11 parameters were agreed upon and the gold standard was taken as achieving 100% of the categories. This is probably unattainable for every cast on every occasion but it helped to focus critical attention. We suggest that the features of a study cast can be divided into "diagnostic" and "aesthetic" features. It is the diagnostic features which are most important and we aspire to achieving as near to 100% as is attainable.

AUDIT PROCESS

70 consecutive study models (35 upper and 35 lower casts) from patients treated by the Registrar were examined by one assessor scoring for the previously defined 11 parameters. The parameters included :

1. All erupted teeth clearly shown
2. Labial sulcus clearly shown
3. Palate (upper cast) or Lingual sulcus (lower cast) clearly shown
4. Absence of air blows
5. Free from plaster debris
6. Correct base thickness – between 30 to 35 mm on average from base of study model to occlusal plane of teeth
7. Heels of models cleared for occlusion
8. Models trimmed to the standard angles to help locate each upper study cast to the corresponding lower study cast more easily
9. No teeth damaged or broken on the model
10. Absence of plaster defects
11. Correct labelling of study models

Items 1 to 4 were deemed factors affecting study models due to clinical technique, whilst items 5 to 11 were deemed factors due to laboratory technique. Deficiencies in the items 5, 6, and 10 : 'free from plaster debris', 'correct base thickness' and 'absence of plaster defects' were regarded as aesthetic faults.

However, 'free from plaster debris' indicates there was no plaster debris in the sulci and palate areas. No plaster debris on occlusal surfaces of teeth was noted in this sample and so the presence of plaster debris in the casts in this sample was recorded as an aesthetic fault rather than a diagnostic fault. In this sample, where a set of models was found not to articulate well the cause of this was looked into and always found to be due to interference from the heels of the models rather than from any defects on the occlusal surfaces of teeth.

Errors which could affect diagnosis are represented by items 1, 2, 3, 4, 7, 8, 9 & 11. Errors to do with aesthetics are represented by items 5, 6 & 10.

RESULTS

- Only 50% of the models examined achieved the set gold standard.
- There were potential diagnostic errors in 47% of the models and aesthetic faults in 9% of the models.
- 14% of models showed errors due clinical technique, the most common error being the presence of air blows within the cast.
- 46% of models showed errors due to laboratory technique, the most common error being the presence of one or more damaged or broken teeth.
- The most common error was the presence of damaged or broken teeth.
- 54% of upper models achieved the gold standard whereas only 46% of the lower models did so.
- 26% of upper models and 49% of lower models had damaged teeth.
- 9% of upper models and 17% of lower models showed the presence of air blows.

The three most frequently occurring faults were :

1. Damaged or broken teeth (37% of models)
2. Presence of air blows (13% of models)
3. Presence of plaster defects (9% models)

100% of study models had :

- All erupted teeth clearly shown
- Free from plaster debris
- Correct base thickness
- Correct labelling of study models

DISCUSSION

In the literature, Ismail¹ reported that in their audit on the quality of study models produced by a commercial laboratory, 68% of the models met their gold standard. However that audit only looked at defects of teeth, deficiencies in trimming, and incorrect labelling of study models. The gold standard taken in that audit was for 90% of study models to have none of the mentioned faults. The greatest error resulted from labelling inaccuracies, followed by damaged teeth. Our audit used more parameters and set the gold standard at 100% however please see our earlier comments.

Ponduris's² study models study assessed the impression stage, the wax bite stage and the casting stage. They highlighted a number of important issues to be addressed at each stage and set the gold standard at 100%. The most common error was heels of models not cleared for occlusion, followed by incorrect base thickness and incorrectly trimmed angles. Having damaged teeth was less of a problem. McAuliffe³ carried out a re-audit following the original audit by Ponduris² and showed

a reduction in errors. Problems noted at the impression and wax bite stage highlighted by the original audit however, had not been fully resolved. The authors distributed a second revised protocol after further discussion amongst all the orthodontic clinical and technical staff.

In our audit, the major problem was damage to the model teeth, and the fractured sections of teeth were not always present in the model box. Thus, an accurate orthodontic diagnosis might be made more difficult. However we have avoided many of the common errors identified in the audits found in the literature.

Damage to teeth on models was thought to be partly a laboratory fault. The method of transport could also have been a contributing factor. Models were individually wrapped and sent through the post (instead of upper and lower casts packed together with sponges) which could have increased the risk of fracture. Incorrect clinical technique such as poorly fitting trays and inadequate thickness of alginate surrounding teeth can result in poor quality impressions of teeth. This can lead to an increased tendency for plaster teeth to break off the models. Bearing in mind these particular problems, the authors had ensured that :

- Only very generous trays were used for impressions
- Trays were tried in each patient's mouth to ensure an adequate and comfortable fit
- Generous amounts of alginate were used
- If the teeth captured in the impression were noted to be positioned hard up against the tray the impression was repeated to ensure an even and generous amount of alginate surrounding the dental arch

RECOMMENDATIONS

In light of these findings, we have altered our clinical and laboratory protocols.

Action Plan :

1. Alginate mixing machine purchased so as to allow production of an even and consistent mix of alginate
2. Guidelines issued to laboratory staff regarding the angles for trimming of models and the desired thickness of bases
3. Impressions to be sent to the orthodontic laboratory at the base hospital (using the hospital van) so they can be cast on the same day they were taken. After disinfection the impressions were wrapped in damp gauze, placed in sealed air tight plastic bags and packed in rigid plastic boxes.
4. Study models to be separated by sponges between the teeth and secured with rubber bands. Casts to be returned to the satellite hospital (Ayr Hospital) packed in rigid plastic boxes and sent by hospital van.
5. Care of impressions, study models and the study model archive was specifically included in the duties of the nursing

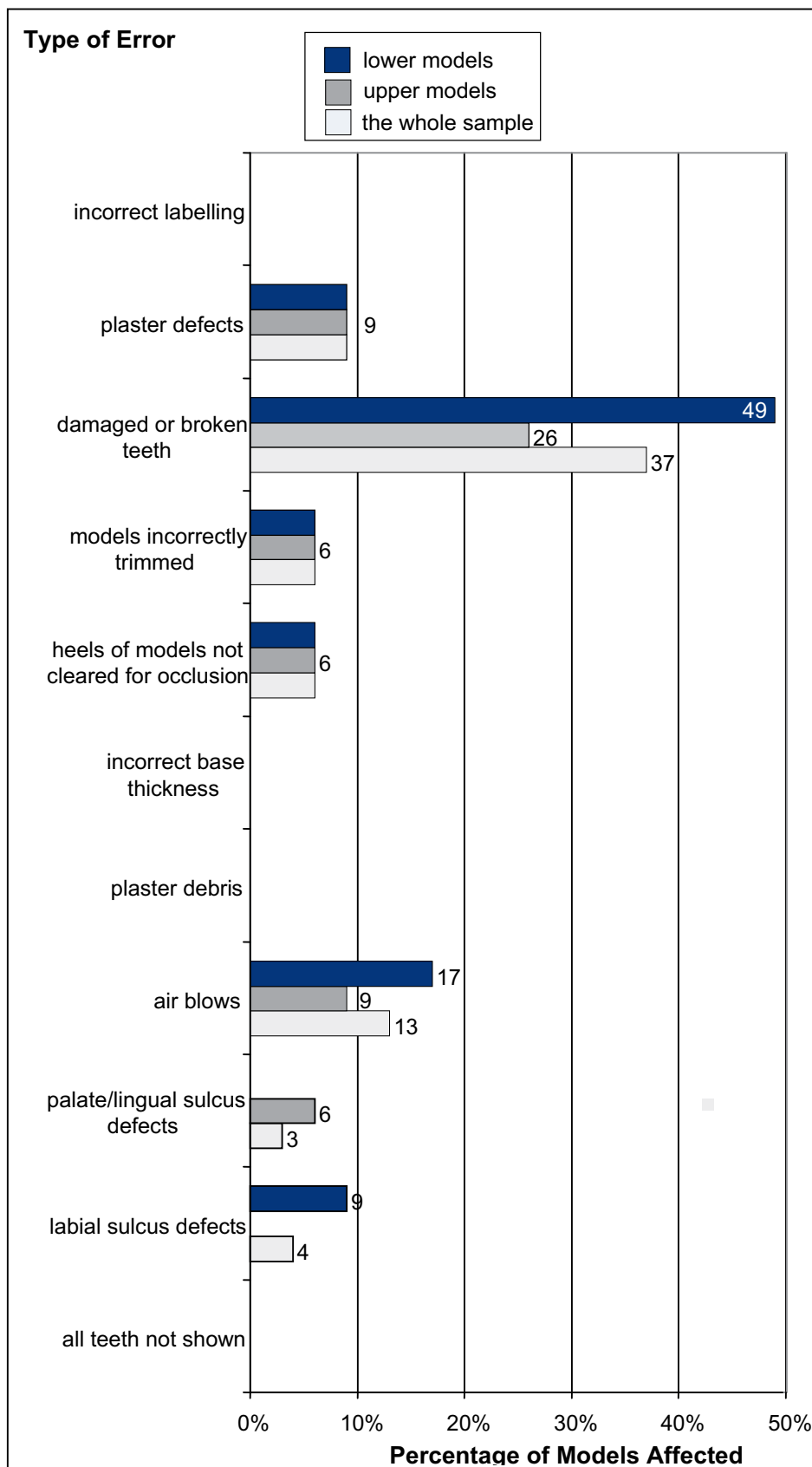


Figure 1. Distribution of errors in the study model sample

6. Re-audit is planned for July 2009

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EVALUATING CLINICAL EFFICIENCY OF THE DAMON 2 SYSTEM

Phil Banks – Burnley General and Fairfield General (Bury) Hospitals

INTRODUCTION

It has been suggested that orthodontic treatment time is reduced with the low-friction self-ligating Damon bracket system but the evidence to support this is unclear¹⁻⁵. As any clinical benefit achieved with this system may vary for different operators, it was envisaged that a personal audit comparing treatment duration and efficiency between conventionally and self-ligated bracket systems would be of value to the individual clinician.

AIMS

1. To compare treatment time and the number of treatment visits using Damon 2 brackets with that seen during treatment with conventionally-ligated pre-adjusted edgewise brackets.
2. To compare bracket failure rates
3. To compare PAR outcomes between the two groups.

STANDARDS

1. Following a discussion at our regional audit meeting a reduction in treatment time of 10% and a reduction of treatment visits of 10%. using Damon 2 brackets was regarded as a clinically worthwhile benefit.
2. Based on previous studies carried out in our departments⁶⁻⁸, bracket failure rates below 6% would be acceptable over the course of treatment.
3. A mean PAR score reduction of over 75%.

AUDIT PROCESS

Thirty patients treated with Damon 2 brackets were audited prospectively. These were compared with a previous thirty who had received pre-adjusted edgewise brackets (A-Company mini-twin Roth 0.022") with conventional elastomeric ligation. All patients were treated by the same operator, an experienced hospital consultant, using similar conventional mechanics. In all cases working and final archwires were adjusted to maintain the patient's original archform, unless expansion was required to correct crossbites. In both groups consecutive patients were included with certain exclusions:

- cleft or orthognathic patients
- patients with syndromes or special needs
- patients needing surgical exposure of teeth
- patients who had a preliminary appliance or lingual arch.

Although the groups were not deliberately matched, the proportion of extraction and non-extraction cases was similar. All patients were monitored to the end of active treatment. Those who moved away from the area during treatment were excluded. In both groups of patients the following data was recorded:

- overall active treatment time and number of visits
- duration of three treatment stages for both upper and lower arches:
 - stage 1: initial archwire to placement of 0.018x0.025" thermal NiTi
 - stage 2: 0.018x0.025" thermal NiTi to placement of 0.019x0.025" steel
 - stage 3: 0.019x0.025" steel to debond
- first-time bracket failure rate (excluding molar teeth)
- mean percentage PAR reduction.

RESULTS

In each group one patient was lost to follow up and the remaining were analysed. The results of overall treatment time, number of treatment visits, first-time bracket failure rates and

PAR outcome scores are shown in Table 1.

	Treatment time (months)	No. visits	1 st bracket failures %	PAR reduction %
Conventional	18.1	12.8	3.6	81.8
Damon 2	16.5	10.6	5.3	84.5
Difference	-1.6	-2.2	+1.7	+2.7
% Difference	-8.8	-17.1	+47.2	+3.3

Table 1. Mean treatment duration and visits, bracket failure rate, and PAR reduction

Overall treatment time

The mean treatment time for the conventionally-ligated system was reduced by 1.6 months (8.8%) when the Damon 2 system was used (18.1, 16.5 months respectively). This did not meet the standard set.

		Conventional		Damon		Difference		% Difference	
		Time	Visits	Time	Visits	Time	Visits	Time	Visits
Stage 1	Upper	3.5	2.9	4.8	3.1	+1.3	+0.2	+37.1	+6.9
	Lower	4.5	2.5	4.6	3.1	+0.1	+0.6	+2.2	+24.0
Stage 2	Upper	3.2	2.2	2.7	1.6	-0.5	-0.6	-15.6	-27.2
	Lower	3.3	2.1	2.6	1.6	-0.7	-0.7	-21.2	-33.3
Stage 3	Upper	10.3	6.4	8.7	4.7	-1.6	-1.7	-15.5	-26.6
	Lower	6.8	4.2	5.5	3.2	-1.3	-1.0	-19.1	-23.8

Table 2. Mean duration of treatment stages for each arch (months and number of visits)

Bracket failure rate

First-time bracket failure rate was slightly higher in the Damon 2 group (5.3%) compared with that seen in the conventionally-ligated group (3.6%) but both groups met the standard.

Mean PAR reduction

The mean percentage reduction in PAR scores was slightly higher in the Damon 2 group (84.5 compared with 81.8) but both groups met the standard.

DISCUSSION

The small reduction in treatment time was a minor advantage when using the self-ligating system. A greater benefit to both clinician and patient was the reduced number of treatment visits. These findings agree with the results of two other studies^{1,2} but both studies showed greater reductions in treatment time. In this audit the reduction was only seen in the intermediate and final treatment stages, but the initial treatment stage was prolonged. This agrees with three other studies³⁻⁵ which also failed to find a reduction during initial alignment. This audit demonstrated that using the Damon system reduced costs to the PCT by approximately £183 per case according to the current NHS tariffs for hospital orthodontic attendances. However the increased cost of the hardware and the higher bracket failure rate resulted in an increase in cost to the Trust of £53 per case. It is not known whether this cost benefit applies to the more complex cases seen more commonly in hospital caseloads, as those investigated here were more routine. Similarly these costings may not apply to treatment carried out in other settings.

CONCLUSION

When compared with the conventionally-ligated bracket system, during use on patients of moderate complexity, treatment with the Damon 2 system produced the following clinical outcomes:

- A clinically worthwhile reduction in active treatment visits (2.2 visits, 17.1%) which met the standard set..
- A clinically small reduction in treatment time (1.6 months,

8.8%) which failed to meet the standard.

- Increased treatment time and visits in the initial treatment stage, but a reduction of both in the intermediate and final treatment stages.
- A higher but acceptable bracket failure rate (5.3% compared with 3.6%).
- PAR outcome scores which were satisfactory and met the standard (in both groups).

ACTION PLAN

The author will continue to use the Damon system and other clinicians who use it in our departments will be encouraged to carry out this personal audit.

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A RETROSPECTIVE AUDIT OF STANDARDS OF ORTHODONTIC CLINICAL PHOTOGRAPHY IN GLASGOW DENTAL HOSPITAL AND SCHOOL

Louise Greene, Ross Jones, Joseph Sherlock, Glasgow Dental Hospital and School

INTRODUCTION

Clinical photographs form an essential part of the health care record and are taken before, during and after orthodontic treatment as a way of monitoring treatment progress and assessing clinical outcome. It is important that these photographs meet specific standards so they are reproducible and accurately represent the patient. The Institute of Medical Illustrators¹ has suggested that three extra-oral and five intra-oral photographs are the standard photo set and it has been said² that these photographs should be taken at least at the start and end of treatment for every patient.

Previously Specialist Registrars (SpRs) in orthodontics at Glasgow Dental Hospital and School took their own clinical photographs and were ultimately responsible for the image quality. However, around four years ago there was a change in the Dental Hospital Clinical Photography Policy, which meant that all patients had to be referred to the Medical Illustration Department. The driving factor behind the change was the Caldicott Review, which aimed to ensure clinical photography upheld the patient's rights of confidentiality, consent and protection against the unlawful processing of data.

The quality of clinical photographs is of particular concern to SpRs because they form an essential component of the clinical case histories that they must submit as part of the Membership in Orthodontics (M.Orth) examination. Following the change in the clinical photography policy, image quality is no longer within the control of the SpR. It was decided to audit the quality of the orthodontic photographs taken by the Medical Illustration Department at Glasgow Dental Hospital.

AIMS

1. To audit the quality of clinical orthodontic photographs taken by the Department of Medical Illustration at Glasgow Dental Hospital and School.
2. To assess the suitability of each set of patient photographs for submission for the M.Orth examination.
3. To discuss the results with the medical illustration team, providing advice and training where necessary
4. To re-audit if appropriate

STANDARDS

The Gold Standards for this Audit were derived from recommendations from the Institute of Medical Illustrators¹ and similar standards were used in a recent audit by Wenger et al (2007)³.

It was decided that 90% of clinical photographs taken should meet the Gold Standards set out below:

EXTRA-ORAL, FRONTAL

No glasses, jewellery or collars of clothing. Face filling frame. Hair behind ears. Pupils parallel to the horizontal. Eyes open
Smiling

No glasses, jewellery or collars of clothing. Face filling frame. Hair behind ears. Pupils parallel to the horizontal. Smiling.
Eyes open

¾ view

Patient rotated, pupils horizontal. Tip of nose in line with outer margin of cheek. No glasses, jewellery or collars of clothing. Hair behind ears. Eyes open

Profile

Right Profile with Frankfort or Reid Plane horizontal. Hair behind ears. No glasses, jewellery or collars of clothing. Eyes open

Intra-Oral, anterior

Labial segment parallel to the occlusal plane. Teeth in occlusion

Buccal (Right and Left)

Occlusal plane close to horizontal. All of first permanent molar visible in occlusion. At right angles to teeth. Teeth in occlusion
Occlusal (Upper and Lower)

Arch in centre of the photograph. All of first permanent molars must be visible. No mirror misting. No cheeks, lips or tongue obscuring teeth

METHODS

Prior to commencing the audit there was a period of calibration. One set of nine photographs, which met all of the Gold Standards, was compared with ten randomly selected sets of clinical photographs of orthodontic patients. Two authors (LS & RJ) independently inspected the images and consensus was reached on how image quality and suitability for submission for the M.Orth examination should be assessed for the audit.

The audit was retrospective and one hundred randomly selected sets of clinical photographs taken between March 2005 and May 2007 were inspected by one author (LG). All of the images were of patients who were treated by SpRs preparing for the M.Orth examination. Following discussion and training with the medical illustration team the audit process was repeated for another one hundred sets of clinical photographs taken between May 2007 and August 2008.

As well as comparing individual photographs against the Gold standard, each set of photographs was assessed to determine if they were of a high enough standard for submission as part of the M.Orth examination. Minor errors, such as the patient wearing earrings/glasses or minor positional errors, were deemed acceptable for submission. However significant errors which meant an aspect of the patient was inaccurately represented, such as greater than half of first permanent molars not being visible on buccal views thus not recording molar relationship, were deemed to be below the standard suitable for submission.

RESULTS, FIRST ROUND DATA COLLECTION

➤ 360 of the 900 clinical photographs (40%) fell short of the Gold Standard (Figure 1)

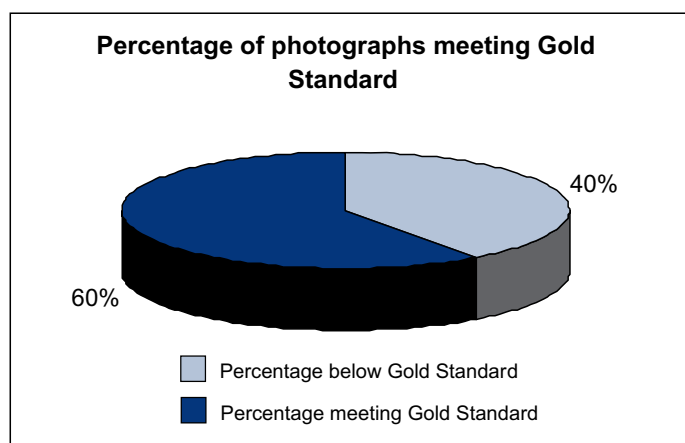


Figure 1. Photographs meeting the Gold Standard

➤ 54 of the 100 clinical photographic sets (54%) were deemed below the standard for submission for the M.Orth examination (Figure 2).

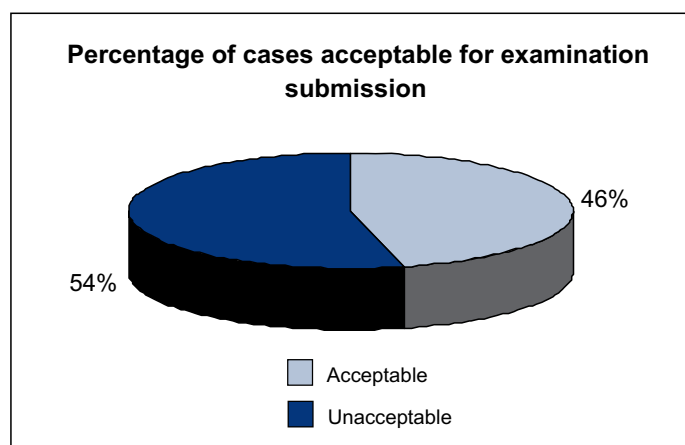


Figure 2. Cases suitable for submission for Membership of Orthodontics examination

- Buccal shots displayed the most faults with the camera not at right angles to the teeth in 40%, and the occlusal plane not horizontal in 16%.
- However, the greatest issue was not being able to see the distal of first permanent molars, 121 buccal photos (60%) displayed this error.

The results were discussed with the medical illustration team prior to second round data collection.

RESULTS, SECOND ROUND DATA COLLECTION

➤ 222 of 900 photographs (25%) fell short of the Gold Standard (Figure 3)

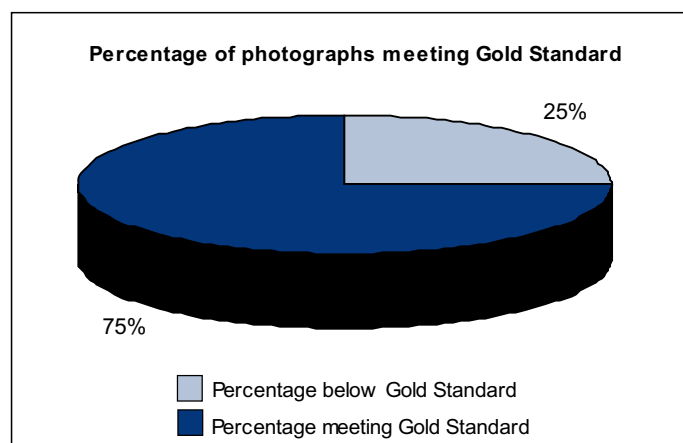


Figure 3. Photographs meeting the Gold Standard

➤ 16 of the 100 clinical photographic sets (16%) were deemed below standard for the M.Orth examination (Figure 4)

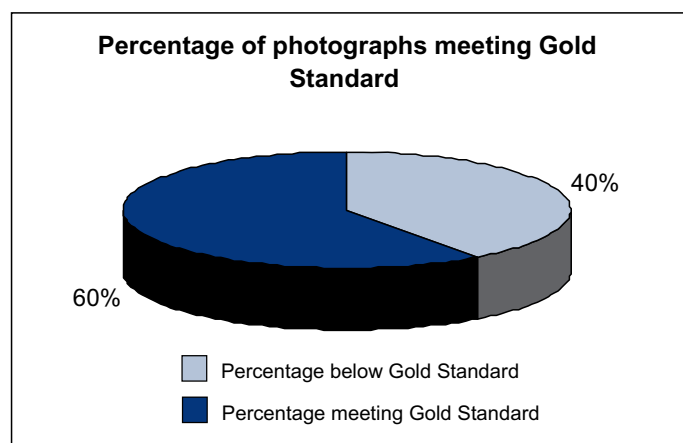


Figure 4. Cases suitable for submission for Membership of Orthodontics examination

➤ 59 of 200 (30%) of buccal shots did not have the distal of the first permanent molars on view, a vast improvement from 60% during the first cycle.

In both cycles extra-oral photographs showed errors such as piercings and glasses left on, hair not behind ears and pupils or Frankfort plane not parallel to floor (Table 1). There was a generalised improvement shown at second round data collection

EXTRA-ORAL	1 st Round data collection % below standard	2 nd round data collection % below standard	% improvement
FRONTAL	29	25	4
FRONTAL SMILING	27	22	5
¾	31	14	17
RIGHT PROFILE	20	14	6

Table 1. Breakdown of extra-oral photographs below Gold Standard

Intra-oral photographs also showed errors e.g. tongues obscuring teeth, distal of first permanent molars not on view, occlusal plane not horizontal (Table 2). Again there was an improvement shown at the second round of data collection.

INTRA-ORAL	1 st Round data collection	2 nd round data collection	
	% below standard	% below standard	% improvement
ANTERIOR	3	3	0
R BUCCAL	75	61	14
L BUCCAL	74	51	23
UPPER OCCLUSAL	47	18	29
LOWER OCCLUSAL	54	14	40

Table 2. Breakdown of intra-oral photographs below the Gold Standard

DISCUSSION

A similar audit has been carried at the Orthodontic Department of Norfolk and Norwich University Hospital³ using similar criteria. They found 24% and subsequently 18% of the 675 photographs they analysed were below the Gold Standards.

The audit has highlighted that the quality of clinical orthodontic photographs being taken within Glasgow Dental Hospital and School currently falls short of the 90% target. Finding that 16% of the photographic image sets were deemed below the standard for submission for M.Orth examination is of significance to the SpRs within the department.

The main issues were with buccal shots where the distal, and indeed in some cases all of the first permanent molars were not visible. Potential contributing factors are the use of inappropriately sized retractors or inappropriate use of retractors. It has been suggested in a recent paper on clinical photography² that when taking buccal shots, the photographer use the smaller end of the retractor on the side of interest and immediately before capturing the image, pull it another 4–5 mm distally and buccally from the teeth to ensure the distal of the first molars is on view. An assistant should passively hold the large end of the retractor on the opposite side.

- In our case the medical illustration department felt they had been misinformed as to what buccal shots should display. They had previously been advised to include the first permanent molars, but not advised that the distal aspect of the first permanent molars must be on view. It was not until new Specialist Registrars started in October 2006 that this issue was highlighted to photography staff. This would account for the low percentage of photographs showing the distal of first permanent molars, and meeting the Gold Standard, during our first round of data collection.

- Interestingly there was a 10% difference between the standard of right and left buccal shots at second round data collection. This may be due to the photographer standing on the patient's left hand side to take the left buccal photograph, and then simply leaning over to take the right buccal shot, resulting in reduced quality.

A number of occlusal shots had fingers in view, perhaps highlighting inappropriate use of mirrors. It has been suggested² that long handled mirrors be held by the photographer to give them control of the photograph whilst keeping assistants fingers out of the shot. The Medical Illustration staff at Glasgow Dental Hospital have also suggested that the wider aspect on new digital equipment is contributing to the increased likelihood of fingers in view.

CONCLUSIONS

A reduction from 40% to 25% of clinical photographs falling below the Gold Standard is a vast improvement. The low number of photographs meeting the Gold Standard during the first cycle probably owes itself to the breakdown in communication regarding display of the distal of first permanent molars.

The quality of clinical photographs currently falls short of our target of 90% meeting the Gold Standard. Therefore continued monitoring and attempts to improve on photographic quality is essential. It would be prudent to carry out a similar audit in a few months time to ensure the standards are continuing to improve.

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Guidance for prospective authors

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 - **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 (97) 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 Word97 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
 1. *Smith J, Brown A (2005) Results of superb treatment. J Orthodont Surg 59: 103-6*

