



The British Orthodontic Society Clinical Effectiveness Bulletin

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Chairman's Update

Bulletin n.

- 1. A short official statement of news**
 - 2. A regular list of information issued by an organisation or society**
- OED**

The more perceptive of our readers will have noticed a subtle change in the title of this publication.

The Newsletter was first published in 1991 and originally came out twice yearly. Since 1995, the Newsletter has been published annually and has been acclaimed nationally and indeed internationally, not only within our own specialty, but across dentistry as a whole. Your committee believed that the name 'Bulletin', would not only more closely reflect the nature of the publication but also distinguish it from the BOS Newsletter, which is usually produced around the same time of year.

This issue of the Bulletin continues the strong tradition of high quality good reports being carried out from within all sections of our society. A wide range of topics is covered, from referral and record taking to training and clinical matters. Of particular interest is a collaborative audit from a number of practitioners in Shropshire.

Thanks are due to Gavin Barry and Jeremy Knox for all their hard work in publishing this Bulletin and also to the FTTA's in Orthodontics who, for the first time, were acting as referees.

Your committee is currently planning three national audit projects. The first project will audit patient satisfaction with orthognathic treatment. A questionnaire has been developed at Bristol and has been adapted for this national study. Much credit must go to Helen Travess and Alison Williams for their hard work in producing the questionnaire. This first project will also act as a pilot for the second, much larger project which will aim to audit patient satisfaction with all orthodontic treatment carried out over a specified period in the UK. The third project will audit adverse and unplanned incidents occurring during orthodontic treatment. Although still in the early planning stages, it is evident that this is an ambitious project. Headed up by Derek Willmot, this audit may ultimately be web based.

The production of Clinical Guidelines has now come under the remit of the clinical effectiveness committee. This year, following much hard work by Ros McMullan and Alison Williams, a guideline for GDPs on the management of first molar extraction in children, has been produced. This document has had the gestation period of an elephant, requiring much cross speciality consultation. Thanks must also go to Jamil Hussein, Donald Burden and Pat McSherry for rewriting the management of the palatally ectopic canine guideline. Both these and other guidelines can be viewed in the Faculty of Dental Surgery section on the RCS England website.

I am also pleased to report on a joint OMFS and orthodontic initiative. From the findings of the second national audit project; it was proposed that record taking in orthognathic cases could be improved. A minimum data set was suggested and now produced, following a lot of hard work by David Morris. A sub committee has met with OMFS representatives who are now considering our

proposal. It is hoped that the process will yield not only a minimum dataset, but also protocols for patient care. Many thanks are due to the hard working members of this committee. My particular thanks go to our secretary Ros McMullan for her dedication and efficiency; and for keeping me on the straight and narrow!

Julian O'Neill *June 2004*

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CONSULTANT SUPERVISION OF ORTHODONTIC SPR TRAINING

C M McCarthy, Essex County Hospital, Colchester

INTRODUCTION

Consultant supervision of specialist registrar (SpR) training is important to optimise training and maintain high standards of patient care. Although there are no agreed National Guidelines, it has been reported that the Faculty of Dental Surgery, RCS has advised 60% supervision as a minimum standard¹. A Regional Audit carried out at the Mersey Deanery¹ set standards using a new grading system. This new system was used to audit levels of consultant supervision for orthodontic SpR's within the Eastern region.

AIMS

- To determine the level of consultant supervision of orthodontic SpR's within the Eastern Deanery.
- To calculate the average time taken for each consultant to respond to a request for advice.
- To subsequently set a standard for the Eastern Region.

STANDARD

The standard that had been set for the Mersey regional audit¹ was used for comparison. (Please see Table 1 full description of 4 point grading system)

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

METHOD

The audit involved seven SpR's at five district general hospitals within Eastern Region, with a total of seven consultants. A 3-month period of prospective evaluation was undertaken with all consultants blinded to the start and finish of the audit (20th January — 20th April 2003).

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

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

Data collection

Each session was graded using the four point scale of consultant supervision (Table 1). For each patient episode, the time taken for the consultant to respond was estimated and recorded.

RESULTS

A total of 211 sessions were audited over the 3-month period, including 994 patient episodes (Table 2). Overall 91% of sessions had levels of consultant supervision at grades 1 and 2. SpR's B,D,E,F,G had 100% of sessions at grades 1 or 2. SpR C had 80% and SpR A had 79% of sessions at grades 1 or 2.

Table 2. Results for Supervision Grade

SpR	A	B	C	D	E	F	G	TOTAL (%)
No. of sessions	29	20	65	20	13	29	35	211 (100%)
Grade 1	13	14						27 (13%)
Grade 2	10	6	52	20	13	29	35	165 (78%)
Grade 3								0 (0%)
Grade 4	6		13					19 (9%)

There was a wide range in the number of patients seen with the consultant (59 to 327) which is also reflected in the number of patients per session (Table 3). The mean response time per request was generally less than five minutes.

Table 3. Results for Response Time

Table 3. Results for Response Time

SpR	A	B	C	D	E	F	G	MEAN
No. of patients	59	116	148	33	78	233	327	142
No. of requests per episode	2	6	3	2	6	8	9	5
Mean response time	4	<7	<7	3	<5	<5	<5	<5

DISCUSSION

Comparison with the standard set by the Mersey Region demonstrates that overall the level of supervision in the Eastern region is in the 'excellent' category. Six of the 7 SpR's have supervision levels in the 'excellent' category with one (A) in the satisfactory category. The mean response time was generally less than five minutes.

RECOMMENDATIONS

Table 4. Supervision standards

Supervision	
Less than or equal to 70%, Grade 1+2	= Unsatisfactory
70-89%, Grade 1+2	= Satisfactory
Greater than or equal to 90%, Grade 1+2	= Excellent
Response Time	
Greater than 7 minutes	= Unsatisfactory
5-7 minutes	= Satisfactory
Less than 5 minutes	= Excellent

Future audit projects include continuing the audit spiral in the Eastern Region to "close the loop". It would be interesting to promote a similar audit in a teaching hospital for direct comparisons to be made.

CONCLUSIONS

- Individually and collectively there is greater than 75 % Grade 1 and 2 level of consultant supervision of all SpR's in all Eastern Region units.

REFERENCES

1) Scholey J M, Pender N. Consultant supervision of orthodontic SpR's. *Ann R Coll Surg Eng (Suppl)* 2002; 84:20.

Acknowledgements: To all SpR's in the Eastern Region who collected data for this audit.

AUDIT OF CONSENT FOR ORTHODONTIC TREATMENT

Mary Lo and Wei Luen Yap, Rotherham General Hospital

AIMS

1. To investigate the usefulness and effectiveness of the following;

- a) Treatment planning and Consent protocol.
- b) "Consent for Orthodontic Treatment" form used in the Orthodontic Department of Rotherham General Hospital.

2. To identify whether patients and parents were informed and understood;

- a) The orthodontic treatment that was proposed and the goals, risks, limitations and length of treatment of that particular treatment option.
- b) The alternative treatment options that were available together with the goals, risks, limitations and length of treatment of these options.

BACKGROUND

In this age of the vexatious litigant², negligence claims are on the increase. Any investigation, treatment or deliberate touching without consent may constitute the offence of battery. Orthodontists amongst other specialities are realising the importance of the need for a written consent agreement. Without a valid consent to treatment, a clinician may be vulnerable to criticism on a number of counts, including assault and negligence. A patient also has the right to say what may be done to him or her.

For consent to be valid it has to be informed and sufficient information must also be given to make an informed judgement. The clinician should use a non-technical language and explain the benefits and risks of treatment. The various options should be discussed and there should also be an opportunity for the patient/parent to ask questions. The patient must be competent to give consent and it should be given freely without any duress. Consent could also be withdrawn at any time by the patient during treatment.

In Rotherham, following the treatment planning appointment and signing of the "Consent for Orthodontic Treatment" form, a formal letter is addressed to all patients/parents and their General Dental Practitioners highlighting all treatment options that were proposed, together with the goals, risks and limitations of the particular treatment option that was chosen by the patient.

STANDARD

All patients undergoing treatment should have been properly and identifiably consented. Therefore, 100% of parents and patients should be aware of the treatment options, goals, risks, limitations and the length of orthodontic treatment. This is advice given by the Medical Defence Union and the working party of the British Orthodontic Society since 1995 and hence one would expect a 100% consent record for every clinician.

MATERIALS AND METHOD

A questionnaire was drafted related to important aspects in the delivery of consent (see Table 1). Fifty questionnaires were issued to the parents and/or patients being treated consecutively by the Consultant and the Senior Specialist Registrar at Rotherham General Hospital during the period of December 2003 and February 2004. In each questionnaire, 6 questions were asked which requested a tick of the appropriate column. A separate section was provided for comments. It is assumed all parents and patients were honest

in their responses. To encourage this, parents and patients were advised that any results would be kept anonymous.

RESULTS

All 50 questionnaires were completed and returned. The results are as follows:

Table 1.

QUESTIONS ASKED	RESULTS		
	Yes	No	Not sure
Q1. Were you given a copy of the written consent form	49 (98%)	0	1 (2%)
Q2. Was sufficient information given to your satisfaction prior to the start of your child /your orthodontic treatment	50 (100%)	0	0
Q3. Was the proposed orthodontic treatment and alternative option explained to your satisfaction by the clinician	50 (100%)	0	0
Q4. Were the limitations, risks and drawbacks for the orthodontic treatment explained to your satisfaction by the clinician	50 (100%)	0	0
Q5. Were the length of treatment and commitment required for the orthodontic treatment explained to your satisfaction by the clinician	50 (100%)	0	0
Q6. Do you think it was beneficial to receive a written formal letter of your treatment planning and consent, highlighting the goals, limitations and risks of orthodontic treatment	50 (100%)	0	0

DISCUSSION

- All patients/parents were satisfied and happy with the information they were given as regards to treatment goals, risks, limitations and retention strategies.
- One parent was not sure if they were given the copy of the signed consent form (Q1). However, this parent answered "YES" to the remaining five questions. It is routine practice to hand a copy of the consent form to the patient/parent immediately after it is signed.

- One parent commented that the discomfort/pain that they experienced after the placement/adjustment of the fixed appliances should be highlighted during the treatment planning. Clinicians and dental nurses routinely mention this following the placement of the fixed appliances. The dental nurses also give instructions regarding;

- i) Cleaning and maintenance of the orthodontic appliances.
- ii) Who to contact if problems arise.

The patient always receives a Fixed Appliance Instruction Leaflet which reinforces the fact that teeth may be tender for a few days after the appliance is fitted/adjusted.

CONCLUSION AND RECOMMENDATION

A change of practice to explain to patients during the treatment planning and consent appointment that they will experience a degree of discomfort following the initial placement and readjustment of their fixed appliance.

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- 3) J Tiernan. Consent and information. The Dentist 18-21 Nov 2001.
- 4) Consent to treatment. Medical Defence Union guide, 2001.

STANDARDS AND LEGIBILITY OF ORTHODONTIC CASE NOTES IN MERSEY DEANERY

M.S.F.LO, J.E.Harrison and J.W.Jones

Liverpool University Dental Hospital, Liverpool and #North Cheshire Hospital, Warrington

INTRODUCTION

The quality of hospital medical and dental records is a frequent source of frustration to clinicians. The need to improve hospital records is well recognized and has been emphasized over the years in government reports as well as by individuals.

The core of the health information system in the hospital lies in the hospital records.

Good standards in hospital records can lead to improved quality of care.

AIMS

- To evaluate the quality and legibility of written hospital records by reviewing entries made by all clinicians
- To identify areas of deficiency of written hospital records
- To take appropriate action to rectify any deficiency identified

STANDARD

The "Gold standard" used in this study was that all case notes must consist of:

- Date of each visit with appropriate entry made
- Clinician's legible name and signature
- Legible writing
- Writing in black ink that photocopies well
- Details and planning of future procedures

This is advice given in the minimum data set by the British Orthodontic Society and Royal College of Surgeons of England.

MATERIALS AND METHODS

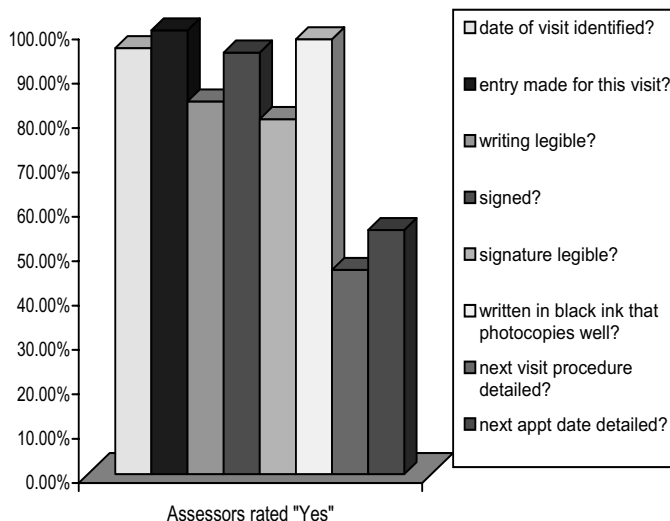
The study was a retrospective audit involving seven units in the Mersey Deanery. Most recent full-page of case note entries for 25 patients undergoing orthodontic treatment were collected and photocopied during February 2002 for each clinician present in the 7 units involved. The 25 case note samples were coded for each clinician and numerically ordered. Four numbers were selected randomly for each clinician and the corresponding numbered case note selected for audit of that individual. All abbreviations entered into the case notes were identified and noted. Anonymous copies of these records, along with tick box assessment sheets listing all the identified abbreviations, were subsequently distributed for assessment. This was undertaken by one SpR project co-ordinator and nursing staff within each department.

DISCUSSION

Inadequate hospital records limit audit and make it difficult to defend medico-legal claims. The legibility of clinicians' handwriting should not be underestimated and was discussed when the results were presented at a regional audit meeting. Another specific area of concern was that only 50% of the case notes showed future planning of treatment stages. These factors can adversely effect continuity of care especially where this is provided by more than 1 clinician. This may lead to unnecessary prolonged treatment time. Individual clinicians have been provided with feedback relating to their performance.

RESULTS

The results were given as percentages of ideal entries and understandable abbreviations for each of the individuals and each unit. The overall summary of the Deanery were:



CONCLUSIONS

The majority of the clinicians had high standards of case note legibility and clarity. However, certain clinicians recorded inadequate information or had poor legibility.

RECOMMENDATIONS

The implementation of standard departmental guidelines on case notes recording to provide uniform and adequate clinical information. Clinicians should only use approved abbreviations that all members of the departmental staff are familiar with. This list of abbreviations should be introduced to all departmental staff.

This audit was a useful exercise and after the above recommendations have been implemented, the audit will be repeated in approximately 2 years time and on future regular intervals.

ACKNOWLEDGEMENTS AND THANKS TO:

Mrs S Pender for all help in data analysis, the 5 SpR unit co-ordinators for their hard work and co-operation and most importantly all the staff at the 7 hospitals for their co-operation, patience and time.

REFERENCES

- 1) British Orthodontic Society: *Orthodontic records Collection and Management 1999 - Appendix 1 minimum data set.*
- 2) The Royal College of Surgeons of England: *Guidelines for Clinicians on Medical Records and Notes, 1994.*
- 3) A E Kark. *Low Standard of Hospital Records. Annals Royal College of Surgeons of England 82 (5 Supp): 175, 2000*

COLLABORATIVE CLINICAL AUDIT. OUTCOME OF ORTHODONTIC TREATMENT. PRACTITIONERS ACCEPTING REFERRED ORTHODONTIC PATIENTS IN SHROPSHIRE

C Purkiss

Introduction

The aim of this collaborative audit was to assess treatment outcome by examining study models. Five practitioners participated in the audit. One member of the group is a specialist orthodontist, another is a GDP on the orthodontic specialist register. The 3 other members are GDPs who have completed the West Midlands Orthodontic Clinical Assistant Training Program Two have practices restricted to orthodontics while the third also continues to treat a number of GDS patients. All GDPs continue to hold Clinical Assistant posts. The two Specialist members accept direct orthodontic referrals whilst the 3 "GDPs with Special Interest" routinely seek Consultants' advice on treatment plans.

Standards

Previously published audits suggest that, to achieve a good standard of orthodontic treatment, the mean reduction in PAR score should be greater than 70%. It is also suggested that the number of patients falling into the "Worse / No Improvement" category should ideally be less than 5%.

The currently accepted criteria for Treatment Need is that patients falling into IOTN DHC categories 4 and 5 have a high need for orthodontic treatment, irrespective of their Aesthetic Component (AC) score. Patients in IOTN category 3 are considered to have a borderline dental health need for treatment, but those with an AC rating greater than 6 are considered to need treatment on aesthetic grounds.

Method

Only completed cases were included in the audit. Mixed dentition interceptive cases were excluded, as were cases discontinued before treatment was completed. Each practitioner submitted 20 most recent consecutively completed cases. The following information was recorded from the models: IOTN, dental and aesthetic component pre- and post-treatment PAR, pre- and post-treatment scores

All scoring was carried out by an independent dental technician calibrated in the indices on the Cardiff course. Intra-examiner error was assessed by repeat sampling of a sample of 10 sets of models after a period of 4 weeks.

Results

Graph 1 and Table 1 show that 88% of cases had a start IOTN of 4 or 5, and 11% were IOTN 3, each with an aesthetic component higher than 6. This indicates that all cases sampled with one exception were patients with a high need for orthodontic treatment.

Graph 1. Start and finish IOTN scores NB need IOTN scores on x axis

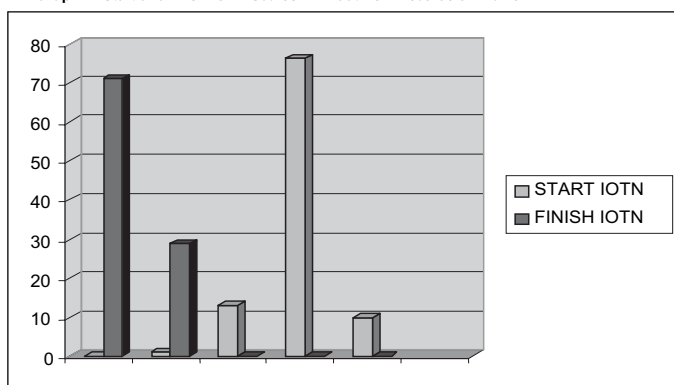
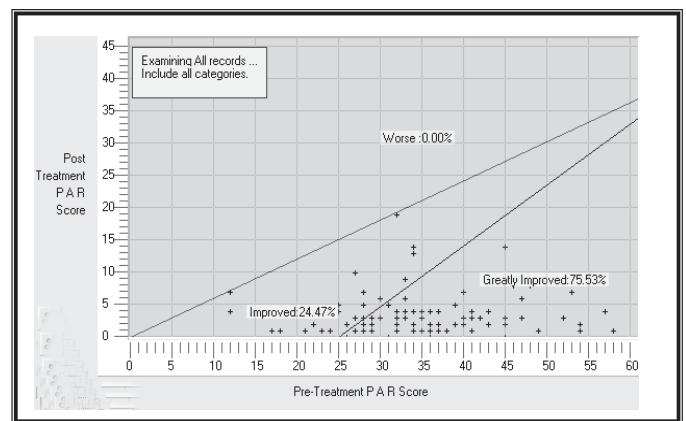


Table 1. Summary of start and end IOTN scores

IOTN		Start	End
Dental Health Component	High Treatment Need (4,5)	88%	0%
	Treatment Need (3, AC > 6)	11%	0%
	Low Treatment Need (2d)	1%	29%
	Low Treatment Need (1)	0%	71%
Aesthetic Component	High Treatment Need (8 - 10)	78%	1%
	Mod Treatment Need (5 - 7)	21%	0%
	Low Treatment Need (1 - 4)	1%	99% (1 or 2)

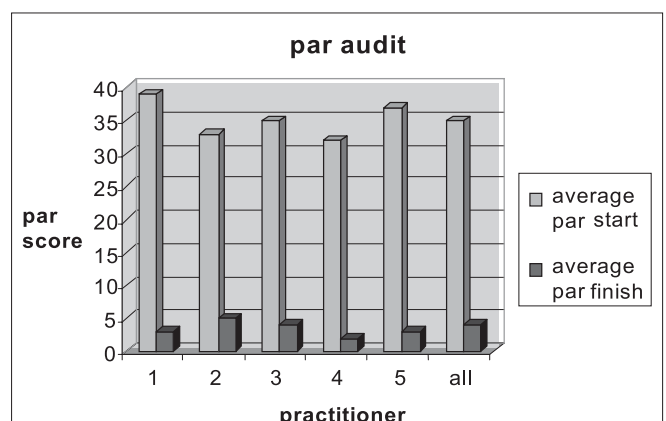
Graph 2. Nomogram treatment PAR changes



It can be seen from the nomogram (Graph 2) that 75.5% of all cases fell into the "Greatly Improved" category. A further 24.5% were "Improved" with none in the "Worse/No Difference" category. This suggests the practitioners are treating cases with a high initial treatment need to a high standard.

In this audit the overall mean pre-treatment PAR score was 35.3 and the mean post-Treatment PAR score was 3.5 giving a mean reduction in PAR score of 31.8. The mean percentage reduction in PAR score of the cases in this audit was 90%, 24% of cases were "improved" and 76% were "greatly improved" (100% overall). Graph 3 and Table 3 show the performance of the individual operators.

Graph 3. PAR Audit by Individual Practitioner



Continued Over

Table 3. PAR Audit by individual Practitioner

	All	Pract 1	Pract 2	Pract 3	Pract 4	Pract 5
Average PAR Start	35.3	38.8	33.2	35.1	31.8	37.2
Average PAR End	3.5	3.0	5.2	4.3	2.3	2.7
PAR Average Change	31.8	35.8	28.1	30.8	29.5	33.4
PAR Percentage Change	90.0%	92.1%	84.4%	87.7%	92.6%	89.7%
Improved	24%	11%	25%	37%	39%	11%
Greatly Improved	76%	89%	75%	63%	61%	89%

Table 4. Miscellaneous treatment information

Sex Ratio	Male Female	40% 60%
Start Age	Specialists with direct Referrals GDPs with Consultant Advice	13 yrs 14 yrs
Treatment Duration	Removable Single arch fixed Two arch fixed	12 months 16 months 19 months

Table 5. Par reduction seen with removable, single arch, and two arch fixed

Appliance Type & number	PAR Score Pre-Treatment	PAR Score Post-Treatment	PAR Score Reduction	PAR percentage Change
Removable 7	27 (12 – 40)	9 (3 - 13)	18	67%
Single Arch Fixed 8	30.3 (21 – 41)	3.5 (1 - 6)	27	88%
Two Arch Fixed 85	36.4 (16 – 65)	3.0 (0 - 9)	33	92%
TOTAL 100	35.3 (12 – 65)	3.5 (0 - 13)	32	90%

Discussion

It is more likely that a greater percentage reduction in PAR score will be achieved if the initial score is high. Conversely it will be difficult to achieve a “great” improvement if the initial PAR score is low. Indeed a case with an initial PAR score of less than 23 cannot be “greatly improved” using weighted PAR scores. As with other studies, the highest standard of treatment was obtained with two-arch, fixed orthodontic appliances, and this was the treatment of choice in 85% of the cases sampled in this audit.

These figures compare favourably with other audits. We recognise however that exclusion of discontinued and mixed-dentition interceptive cases may have boosted the final results slightly. If, as seems likely, practitioners will have to negotiate with PCTs for the provision of orthodontic treatment in the future, it will be necessary for them to prove that they can provide treatment of an acceptable standard. It will therefore be advantageous for any practitioner wishing to provide orthodontic treatment under new arrangements to regularly carry out an audit of their treatment outcomes along the lines of this audit either on a per-case basis or on a percentage sample.

Conclusions

The audit has indicated that the practitioners involved carried out orthodontic treatment to a high standard. Treatment is carried out on patients with a high need for orthodontic treatment

The specialist practitioners accepting direct referrals are, in general, starting their treatments a year earlier than the GDP’s

who seek treatment planning advice from local orthodontic consultants. This is an indicator of a shortage of orthodontic consultant services in the area.

Suitably trained GDP’s who are provided with treatment planning guidance from a consultant, and who have regular access to consultant advice, are capable of providing a high standard of orthodontic treatment.

Participating practitioners included; Graham Barker, BDS, Oswestry. Philip Barton, BDS, FDS, RCS(Ed), MOrth, RCS(Ed), MdentSci (Lpool) Shrewsbury. John Coombes, BDS, Newport. Helen Newbrook, BDS, Madeley. Colin Purkis, BDS, Wellington. The calibrated technician was Simon Whitehouse, R.D.T, L.O.T.A, Elite Orthodontics, Wellington.

References

With quoted pre- and post-treatment PAR scores shown in italics

- 1) S Richmond, K O’Brien, I Buchanan, D Burden. *Occlusal Indices Victoria University of Manchester, 1992*
- 2) S Richmond, WC Shaw, CT Roberts, W Andrews. *The PAR Index (Peer Assessment Rating). Methods to determine the outcome of orthodontic treatments in terms of improvements and standards. EJO, 1992, 14, 180 -187*
- 3) S Richmond, WC Shaw, CT Roberts, W Andrews. *The development of the PAR Index (Peer Assessment Rating): Reliability & validity EJO, 1992, 14, 125 -139*
- 4) K O’Brien, WC Shaw, CT Roberts *The Use of Occlusal Indices in assessing the provision of orthodontic treatment by the hospital orthodontic service of England & Wales. Journal of Orthodontics, 1993, 20, 25-35*
Juniors: 27.6->8.7 = 63.8%, Consultants: 29.9->7.8 = 70.8%
- 5) S Richmond. *Personal Audit in Orthodontics. BJO, 1993, 20, 135-145 29 ->7 = 74%*
- 6) EA Turnbull, S Richmond, JL Wright. *A closer look at General Dental Service orthodontics in England & Wales BDJ 28 Aug 1999, 187, 26.9->12.8 = 47%*
- 7) *Effectiveness of community-based salaried orthodontic services provided in England & Wales. Journal of Orthodontics, 2002, 29, 119-123 29->6.8 = 74.8%*
- 8) LH The, WJS Kerr, JH McColl. *Orthodontic Treatment with Fixed Appliances in the General Dental Service in Scotland. BJO, 2000, 27, 175-180 22.7->7.8 = 59%*
- 9) D Radzic. *Effectiveness of community-based salaried orthodontic services provided in England and Wales. BJO, 2002, 29, 28.7->5.9 = 77.5%*
- 10) EJ Atkins. *A 10-year retrospective audit of consecutively completed orthodontic treatments in a general dental practice and a hospital orthodontic department. BDJ, 2002, 193, 85-87 30.3->6.1 = 80%*
- 11) RE McMullan, B Doubleday, JD Muir, NW Harridine, JK Williams. *Development of a treatment outcome standard as a result of a clinical audit of the outcome of fixed appliance therapy undertaken by hospital-based consultant orthodontists in the UK. BDJ, 2003, 194, 33 -> 7 = 78%*

AUDIT OF RADIOGRAPHICAL QUALITY OF DPT'S AND COMPLIANCE WITH BOS RADIOGRAPHY GUIDELINES

G.P Power, A.R Thom, Queen Victoria Hospital, East Grinstead

INTRODUCTION

"No patient should be expected to receive additional radiation dose and risk as part of a course of dental treatment unless there is likely to be a benefit in terms of improved management of the patient" (Isaacson and Thom.)¹. There are several indications for Dental Panoramic Tomographs (DPT's) in the general dental setting (FGDP)², and in Orthodontics (BOS guidelines)¹. A panoramic radiograph may be associated with an effective dose the same as 1-6 days additional background radiation.

In 1995 it was proposed in the British Dental Journal that "a mechanism for the clinical audit and peer review of written radiographic reports should be in operation by the year 2001" (Hirschmann)³. The British Orthodontic Society Guidelines on radiography state, "although orthodontic radiographs are taken for a number of reasons, every radiograph must be justified clinically." and "It is good practice to enter the reason in the patient's notes" (Isaacson and Thom)¹.

AIMS

- 1) To determine the number of radiographs that met the standard determined by NRPB⁴, as outlined in Tables 1 and 2.
- 2) Assess compliance with BOS guidelines¹ that all radiographs be clinically justified and reported upon.

STANDARDS

Table 1. NRPB standard of radiographic quality

RATING	QUALITY	BASIS
1	Excellent	No errors of patient preparation, exposure, positioning, processing or film handling
2	Diagnostically acceptable	Some errors of patient preparation, exposure, positioning, processing or film handling, but which do not detract from the diagnostic utility of the radiograph
3	Unacceptable	Errors of patient preparation, exposure, positioning, processing, or film handling, which render the radiograph diagnostically unacceptable

Performance targets can be set based upon these quality ratings. Recommended targets are outlined in Table 2, and these should be achieved within 3 years of implementing the quality assurance programme. An interim target is the minimum achievable standard (NRPB)⁴ in the short term.

Table 2. NRPB targets for proportionate quality of radiographs taken

RATING	PERCENTAGE OF RADIOGRAPHS TAKEN	
	TARGET	INTERIM TARGET
1	Not less than 70%	Not less than 50%
2	Not greater than 20%	Not greater than 40%
3	Not greater than 10%	Not greater than 10%

METHOD

Part 1

A prospective audit of quality of DPT's (dental pantomograph) during the month of November 2003 in the department of maxillofacial and Oral Surgery and Orthodontics was undertaken. In order not to influence the study, nursing staff who positioned the patients and processed films were unaware of the audit.

Each radiograph was assessed, and data gathered using a questionnaire for assessors consisting of 20 questions (YES/

NO). These were grouped into 4 sections as demonstrated in Table 3. An overall subjective rating of the radiographs was then undertaken using the NRPB⁴ subjective image quality rating system (Table 1) as the standard for comparison. This gave a rating of the radiograph as excellent, acceptable or unacceptable. Table 4 shows the results.

Part 2

Patient notes from the audit period were evaluated to assess the compliance with the British Orthodontic Society radiography guidelines¹: firstly that 100% of radiographs should only be taken when clinically justified, and secondly, that all radiographs should be evaluated in the patient's notes. Again, to avoid bias, practitioners in the two departments taking part in the audit were unaware of the second part of the study. Only those patient notes from correctly completed questionnaires were examined.

RESULTS

Part 1

Of 172 DPT's taken, 101 completed forms were returned (59% response rate).

95 forms were filled out correctly, 5 forms were incomplete, and 1 form was incomprehensible.

Table 3. Summary of findings

IDENTIFICATION	%YES	%NO
Name	100%	0%
DOB/No	98%	2%
Radiograph oriented L/R	100%	0%
Date	99%	1%
Artefacts	3%	97%
INCISAL REGION	%YES	%NO
Acceptable	98%	2%
Narrow Incisors	3%	97%
Broad Incisors	2%	98%
Asymmetry	1%	99%
Air Shadow	4%	96%
OCCLUSAL PLANE	%YES	%NO
Acceptable	99%	1%
Concave	2%	98%
Convex	1%	99%
Step-defect	0%	100%
GENERAL FINDINGS	%YES	%NO
Condyles visible	86%	14%
Enough information	98%	2%
Retaken immediately	1%	99%
Retaken within one year	12%	88%
Overexposed	4%	96%
Underexposed	2%	98%

Table 4. Subjective quality assessment

Excellent	60%
Acceptable	38%
Unacceptable	2%

Part 2

Subsequent to Part 1, the patient notes were examined to establish if the DPT's were both justified and reported in the patient's notes.

No. Orthodontic notes examined 34 (39%)
 No. Maxillofacial notes examined 53 (61%)

Table 5. Clinical justification and reporting in casenotes

Department	No. Justified	No. Reported
Orthodontics	13 (38%)	30 (88%)
Maxillofacial	0 (0%)	37 (70%)

DISCUSSION

All radiographs were correctly named and the side identified, but the date of birth and date were missing in 2% and 1% of cases respectively. Artefacts (ear rings, nose and tongue studs etc.) were present in 3%, although these cannot always be removed. There were no cases where the upper removable appliance was left *in situ*, a previous problem that has been addressed. In the incisal region of 4% of cases the air shadow (due to the patient not raising their tongue) resulted in difficulty in identification in the midline. Poor patient placement (too far forward results in narrow incisors, and too far back results in broad incisors) resulted in a blurred incisal region in 5% of cases. Reminding the staff setting up the DPT to ask the patient to remove nose, tongue and earrings and to raise the tongue to touch the palate should decrease these problems.

Only 2% of cases had a concave occlusal plane as a result of the patient's chin being lowered when taking the radiograph, and 1% had a convex plane due to the chin being too raised. Correct horizontal orientation of the face is necessary prior to placing the forehead clamp. It was felt that only in one case the Occlusal Plane was unacceptable for radiographic diagnosis, and had to be retaken.

The largest problem area resulting from the audit was identification of the condyles using DPT's, with 14% of radiographs being unsuitable for providing diagnostic information about the temporomandibular joint (TMJ). The Orthodontic Radiographs Guidelines, however state, "*the region of the TMJ is one of the most difficult areas of the body to visualise well... The DPT film provides only a cross-sectional view at the midpoint of the condyle and will show only gross osseous changes, growths or fractures*". (Isaacson and Thom)¹. Twelve percent of cases had a DPT taken within the previous year, the majority for monitoring unerupted teeth such as canines. This may seem somewhat high, but as impacted teeth make up a sizeable proportion of the orthodontic caseload, it should be interpreted accordingly. Reassuringly, only 1 DPT had to be retaken, as it did not yield sufficient diagnostic information due to placement error.

Six percent of the radiographs were processed incorrectly (4% overexposed, 2% underexposed), but as they yielded sufficient information they did not warrant being retaken. Sixty percent of the radiographs were considered to be "excellent", meeting the 50% interim target for the minimum quality target (NRPB)⁴. The radiographs deemed to be "diagnostically acceptable" constituted 38% of the sample, which is fairly close to the maximum interim target limit of 40%. It is in this area that most work must be performed to reduce this level to 20%.

Two percent of the radiographs were felt to be "unacceptable", well within both the interim and final target ratings.

Part 2

The 0% compliance rate when justifying DPT's in the Maxillofacial department is explained by the protocol followed, that patients have the X-ray requested by the member of staff prior to examination. Although no such protocol exists in the Orthodontic department, only 38% of these X-rays were justified. This is far lower than the 79% of justification found in a similar audit in Bristol in 2003 (Mwangi and Moss)⁵. The European Guidelines on Radiation Protection in Dental Radiology⁶ recommend that "*no radiographs should be selected unless a history and clinical examination have been performed*". The guidelines go on to say that routine radiography, whereby a radiograph is taken regardless of the presence or

absence of clinical signs and symptoms, is unacceptable practice. They qualify this however, by stating that they are not a rigid constraint on clinical practice. Local variations may be required according to healthcare practice and provision.

Eighty eight percent of Orthodontic DPT's were reported in the notes, which is favourable when compared to the 47% found in the audit by Mwangi and Moss⁵. Seventy percent of DPT's taken in by the Maxillofacial department were reported. This audit reveals that both departments fall well short of the 100% standard for justification of radiographs, whilst in Orthodontics the level of reporting in the notes is high at 88%, it must still be improved.

CONCLUSIONS

The initial audit has demonstrated that the quality of DPT radiographs meets the interim target ratings as suggested by the National Radiological Protection Board⁴, but fall short of the final target ratings. Problem areas are mainly of patient positioning and tongue posture. The inability of DPT's to conclusively diagnose the TMJ is demonstrated. Justification and reporting of radiographs fall well short of the 100% level recommended by the BOS guidelines.

ACTION PLAN TO IMPLEMENT IMPROVEMENTS

1. Discuss the problem areas discovered in the audit, and aim to improve the level of "excellent" radiographs to above 70%.
2. Address correct positioning of the patient and asking the patient to raise their tongue.
3. Clinicians should be made aware that DPT's are not appropriate radiographs when diagnosing TMJ problems.
4. Radiographs should only be requested after clinical examination of the patient.
5. Indications for all patient's radiographs requested should be clearly documented in the patient's notes, as per European and BOS guidelines.
6. Reporting should be carried out for all radiographs taken by entering an evaluation in the patient's notes.

Changes will be discussed and implemented within the next 6 months. A prospective audit using the same questionnaire to be carried out in September 2004.

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AN AUDIT TO EXAMINE FAILED ATTENDANCES IN TWO ORTHODONTIC HOSPITAL UNITS

Moira Wong, Susan Butler, Stephen Powell St George's Hospital, King's College Hospital, London.

INTRODUCTION

Failed attendances lengthen the duration of orthodontic treatment^{1,2} and reduce cost effectiveness, which has resource implications for the department and the NHS³. Where a patient cannot attend an appointment, cancellation can allow the clinician to arrange appointments for other patients that are available to attend. When missed appointments are common, the clinician sees fewer patients. Because orthodontic appointments are scheduled on cycles of 4-6 weeks there is little available time in the next several weeks to rebook the appointment

AIM

- To assess the incidence of failed attendances within a teaching hospital unit and a district hospital orthodontic department.
- To determine whether the incidence of failed appointments is acceptable.

STANDARD

In an ideal world there would be no failed orthodontic appointments.

AUDIT PROCESS

Failed attendances over a 12 month period, from October 2001 to October 2002, were examined in two hospital units. A proforma was used to record the details of the patients that failed appointments. This did not include cancelled appointments.

RESULTS

Table 1. Attendances and FTA's at teaching and district hospitals

	No. Postgraduate appointments	No. failed Postgraduate appointments	No. Consultant appointments	No. failed Consultant appointments	Total No. failed appointments
Teaching Hospital	4338	447(10.0%)	1557	298(19.0%)	745(13.0%)
District General	2332	286(12.0%)	902	122(13.5%)	408(13.5%)

The total average incidence of attendance failures in the district general hospital was 13.5% and in the teaching hospital 13%, which was very similar. It was interesting to note that the highest incidence of attendance failures (25%) occurred in the summer holiday months. This was evident across both sites.

DISCUSSION

The results show an unacceptably high incidence of failed appointments. The attendance failure rate for consultants was higher in both units especially in the teaching hospital. This may be due to new patient appointments being sent to an incorrect address. It is, however important that we endeavour to reduce the incidence of failed attendances to ensure efficiency and cost effectiveness of orthodontic treatment within the National Health Service.

IMPLEMENTATION OF FINDINGS

The results have been discussed at a departmental meeting with all staff members and the following will be implemented with the aim of reducing the incidence of failed attendances.

- A summary of the results will be available for patients to read whilst in the waiting area with the aim of educating and informing patients
- After one failed appointment the patient and dentist will be sent a letter informing them of their failure to attend the appointment
- After two consecutive failed appointments the patient will be reviewed on a consultant clinic before receiving further treatment appointments. The commitment to attend appointments will be discussed.

This audit will be repeated over the period December 2003 to December 2004 to determine if these have implementations have resulted in a reduction in failed attendances.

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GENERAL DENTAL PRACTITIONER REFERRAL PATTERN FOR PATIENTS WITH IMPACTED CANINES

S Khan. Newcastle Upon Tyne

INTRODUCTION

The preferred age of referral for patients with impacted canine teeth for successful treatment outcome is between the ages of 10—12¹. Our impression is that referrals from General Dental Practitioners (GDPs) were being made when the patients were older than the ideal age. In addition, there was a suspicion that referrals for advice or treatment were being made to the Maxillofacial Consultants rather than the Orthodontic Consultants within the Maxillofacial Department. This resulted in an inefficient use of time and resources and loss of the valuable window of opportunity to treat some patients.

AIMS

- i) To determine whether or not GDP referrals are made at the appropriate age.
- ii) To determine whether or not referrals are made to the appropriate speciality within the Maxillofacial Unit.

STANDARDS

- i) All patients with impacted canine teeth should be referred between the ages of 10 and 12¹.
- ii) All patients with impacted canine teeth should be referred to the Orthodontic Consultants¹.

AUDIT METHOD

A retrospective study was carried out in which all patients with impacted canine teeth treated surgically over a 7-month period between January 1st to August 1st 2001 were included in the study (53 in total). The study sample was obtained by identifying cases from theatre operating books. The age of initial referral and the speciality to which the patient was referred were determined by looking back to the GDP referral letter in the Hospital notes.

RESULTS

The average age of the 53 patients in the sample was 14.2 years (ranging from 10 to 17). The majority of referrals (65%) were made to the Maxillofacial Consultants, whereas only 34% were made to the Orthodontic Consultants.

DISCUSSION

This audit project demonstrated that referrals for impacted canine teeth were being made later than the ideal age for a successful orthodontic outcome. Several patients therefore opted to have their impacted canine teeth extracted rather than exposed and orthodontically aligned.

The study also demonstrated that the majority of referrals were being made to the Maxillofacial and not to the Orthodontic Consultants. Most patients initially referred to the Maxillofacial Consultants were usually referred on to the Consultant orthodontist for further advice. This represents a further outpatient appointment for the patient to attend. Initial referral and hence assessment by an Orthodontist would allow

treatment planning of the whole malocclusion. In some cases surgery may not even be recommended.

CONCLUSIONS

- i) Referrals for impacted canine teeth were being made later than the ideal age for a predictable and successful orthodontic outcome
- ii) The majority of referrals were being made to the Maxillofacial rather than to the Orthodontic consultants.

PLAN FOR IMPLEMENTING FINDINGS

A letter has been written and circulated to all local General Dental Practitioners outlining:

- i) The need to palpate the labial sulcus for the presence of upper permanent canines at the age of 10, and to refer the patient for specialist advice if there is any suspicion that they are impacted.
- ii) That patients in whom it is suspected that there are impacted canine teeth should be referred to the Orthodontic Consultants in the first instance.

To complete the audit loop this topic will be re-audited in about two years time.

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ORTHODONTIC TREATMENT NEED IN A GROUP OF CHILDREN REFERRED TO SPECIALIST PRACTICE

C. Shields, Causeway Orthodontic Centre, Coleraine

INTRODUCTION

The IOTN enables an assessment to be made of the severity of malocclusions and therefore the appropriateness of referrals. This will help identify if further guidance for referring general dental practitioners is required. IOTN will become increasingly important in practice as future changes to the NHS orthodontic contract may mean only the more severe malocclusions are selected for treatment.

AIM

Assess the need for orthodontic treatment in a sample of 50 consecutively referred school children and compare the present referral pattern with the standard.

STANDARDS

The standards set for this study were:

- 1) All cases referred for treatment should have a clear need for orthodontic treatment with no inappropriate referrals.
- 2) Patients are in need of treatment if their malocclusion falls into grade 5 or above in the aesthetic component (AC) or Grades 3,4 and 5 in the dental health component (DHC) of IOTN.

METHOD

The study group consisted of 50 patients assessed between January and March 2004. Impressions for dental models and dental photographs were taken and the IOTN determined for each patient and the referring practitioner recorded.

RESULTS

The average age of the group was 12 years and 5 months with 42 %male and 58% female. Thirty three general dental practitioners made 1 or more referrals with the greatest number from a single dentist being 7. The results are shown in Figures 1 and 2.

DISCUSSION

In this project nearly all the children assessed (96%) were in need of orthodontic treatment and consequently appropriate referrals.

When the results are further examined 82% fell into grades 4 and 5 of the DHC showing a significant proportion referred were in great need of treatment. The results for the AC of IOTN revealed that 70% were in need of treatment because of their dental appearance. General dental practitioners therefore appear to be correctly referring patients who were most in need of treatment

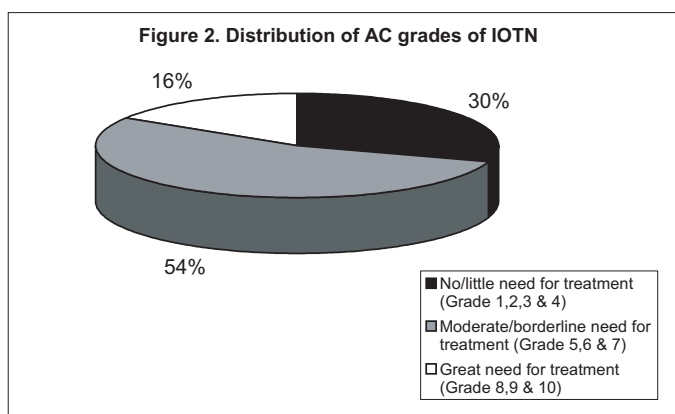
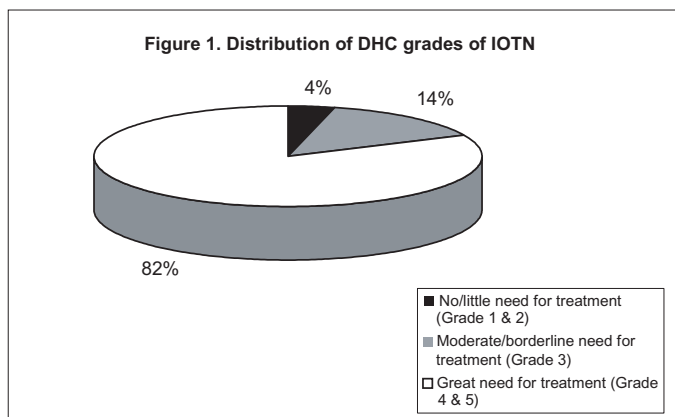
CONCLUSION

In this sample 96% of patients referred to specialist practice were in need of orthodontic treatment as defined by the second standard.

There is only limited scope for reduction in waiting times bearing in mind nearly all referrals were appropriate. Referral patterns will continue to be monitored.

ACKNOWLEDGEMENT

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A RE-AUDIT ON THE QUALITY OF STUDY MODELS PRODUCED IN THE ORTHODONTIC DEPARTMENT

Niamh McAuliffe, Roger Maggs, Peter Durning, Cardiff Dental Hospital

INTRODUCTION

As re-audit is an integral part of the audit cycle it was decided to carry out this re-audit of the quality of study models produced in the Orthodontic Department in the Cardiff Dental Hospital. It aimed to assess if an improvement had occurred as a result of the recommendations of the original audit which was carried out about 18 months previously.

AIMS

To assess the standard of the study models produced in the Orthodontic Department in Cardiff Dental Hospital and to compare the results with those of the previous audit to see if an improvement had resulted from its recommendations.

STANDARDS

The standards for the re-audit were as for the original audit¹ and were agreed by a group of clinicians and technicians. The areas under scrutiny are illustrated in table 1. and are concerned with 1) Impression stage, 2) Wax bite stage, 3) Casting of models.

AUDIT PROCESS

One hundred impressions, wax bites and resulting study models were included in the audit. Each impression and wax bite was examined by a single technician to eliminate variation in scoring. Equally a single clinician evaluated the study models. A proforma was completed for each case by both the technician and clinician. The proforma was completed for 100 cases processed by the orthodontic laboratory from March to April 2004. The impressions had been taken by all members of the clinical staff.

RESULTS

Table 1. Impression stage

	Original Audit	Re-Audit
Wrong tray size	3%	9%
Airblows	30%	34%
Inadequate sulcus depth	50%	36%
Inadequate anatomical detail	15%	12%
Other faults (drags, tray too far forward)	2%	11%

Table 2. Wax bite stage

	Original Audit	Re-Audit
Wax too thin	3%	2%
Posterior teeth not included	58%	20%
Top surface not marked	78%	97%
No bite taken	1%	11%

Table 3. Study model casting stage

	Original Audit	Re-Audit
Inaccurate replication of impression	2%	9%
Incorrect base thickness	25%	20%
Incorrect trimming angles	16%	14%
Inaccurate trimming angles	16%	10%
Broken teeth	10%	8%
Incorrect labels	4%	1%
Heels of models not cleared	44%	11%

The results show varying levels of improvements and also disimprovements. At the impression stage a number of faults showed no improvement though there was a significant improvement in the recording of sulcus depth, with a decrease in the percentage of impressions with inadequate sulcus depth from 50% to 36%.

In assessment of the wax bites, there was an increase in the number of cases in which no wax bite was taken, from 1% up to 11%. There was an increase in the number of wax bites in which the top surface was not marked from 78% to 97%. Both of these faults present significant difficulties for technicians in trying to produce accurately articulated study models. However there was a significant decrease in the number of wax bites which did not include posterior teeth from 58% in the original audit to 20% in the re-audit.

On examination of the study models much of the results were similar to the previous audit however there was a significant improvement in the clearing of the heels of the study models with a drop in the number of models with the heels not cleared from 44% to 11%.

DISCUSSION

This audit highlights the need for the re-audit stage of the audit cycle. Despite the previous audit and its recommendations some of the problems highlighted by the previous audit have not been addressed. With regard to the impressions and wax bites this may be due to the fact that the messages of the previous audit have not been relayed to new specialist registrars and undergraduate students. As for the study models there has largely been some improvement in the results though there is still room for further improvement.

CONCLUSION

This audit has resulted in further discussion with both clinicians and technicians regarding the quality of impressions, wax bites and study models produced in the Orthodontic Department. A reminder of the previously agreed protocols has been distributed to all clinical and technical staff. It is planned that within a few months of the new protocol being distributed that a further re-audit be carried out.

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BONDED RETAINER FAILURE RATES

Phil Banks — Burnley General Hospital and Fairfield General Hospital, Bury.

INTRODUCTION

With increasing emphasis on 'permanent' retention after orthodontic treatment, bonded retainers have achieved popularity in recent years. Disappointingly high failure rates (10% - 47%) have been reported which reduces their effectiveness long term¹⁻³.

Anecdotal evidence suggests high variability of failures for individual operators. To investigate this we carried out an audit of all clinicians in our two orthodontic units.

AIMS

To investigate the failure rates of multistrand retainers for individual operators and for the departments overall.

STANDARD

Retainer fracture rate of 10% or less during the post-debond twelve month follow-up was regarded as acceptable, as follow-up was of relatively short duration.

AUDIT PROCESS

For each operator records were analysed for 20 or more consecutive patients who had been fitted with one or more multistrand retainer at the end of orthodontic treatment. All retainer breakages (complete loss of wire, fracture of some bonds or wire) were recorded over a one year period. Retainers were constructed from 0.0215" Penta-One five-stranded wire (Masel) and were bonded with Transbond LR light-activated composite. Retainers were mostly 2-2 in type (90%) and were placed directly without positioners. A small proportion of retainers featured 3-3 design (10%). In each case, all the included teeth were bonded to the retainer wire. All breakages were recorded together with the bond failure rate.

Of the eight operators included, three had received postgraduate orthodontic training (S) and were on the UK specialist list (consultant, senior registrar and senior dental officer). The other five (C) were general dentists who had been trained for three years as clinical assistants.

RESULTS

Of 284 retainers placed in 207 patients, the overall first-time breakage rate was 30%. There was no difference between maxilla (30%) and mandible (31%). The mean overall bond failure rate was 23%, and 35% of patients were affected. Of the total, partial fracture (of wire or some bonds) accounted for 68%, with the remaining 32% representing total loss of the retainer. Repeat breakages of the same retainer were seen in 18% of cases. The mean time for failure was 5 months. Different clinicians showed great variability with first-time failures varying from 3% to 66%. No clear distinction was seen between specialist and generalist clinicians. Only one operator achieved the set standard. The extended 3-3 design showed a fracture incidence 61% greater than the 2-2 type.

Table 1. Maxillary retainers – All breakages

Operator	Retainers	Part fracture wire or bond # %	Total wire loss # %	All # %
C1	8	1 3%	0 0%	1 12%
S1	13	1 8%	0 0%	1 8%
S2	15	4 27%	0 0%	4 27%
C2	9	3 33%	0 0%	3 33%
C3	13	7 54%	7 54%	14 108%
C4	15	1 7%	3 20%	4 27%
C5	14	1 7%	2 14%	3 21%
S3	12	7 58%	1 8%	8 67%

Table 2. Mandibular retainers - All breakages

Operator	Retainers	Part fracture wire or bond # %	Total wire loss # %	All # %
C1	25	8 32%	1 4%	9 36%
S1	23	0 0%	0 0%	0 0%
S2	25	2 8%	2 8%	4 16%
C2	34	14 41%	5 15%	19 56%
C3	16	9 56%	3 19%	12 75%
C4	20	5 25%	4 20%	9 45%
C5	23	1 4%	1 4%	2 8%
S3	18	7 39%	5 28%	12 67%

DISCUSSION

The overall failure rates were comparable with other studies but the percentage bond failure rate was higher (previously reported as 3-20%³). There was no difference in performance between the specialists and generalists. The breakages cannot be attributed to a small number of destructive patients as the percentage of patients involved was high. Since all operators used the same materials, variability must be explained by the precision of technique used⁴. Interestingly, one clinician (S1) had no bond failures (1 wire fracture only) for the 36 retainers placed, whilst another experienced 53%. Failure rates were similar for maxilla and mandible. This disagrees with previous studies³ but probably reflects that maxillary retainers in our patients were only fitted out of occlusion. The increased failures of the 3-3 design confirmed our clinical impressions and probably relates to greater masticatory forces in the canine region and increased difficulty in retainer placement.

CONCLUSIONS

All operators except one failed to meet the standard set. Most failures were related to bond failures with poor technique implicated. Retainers with a 3-3 design fractured more frequently than the 2-2 type.

PLAN FOR IMPLEMENTING FINDINGS

Results were discussed with all clinicians who were encouraged to refine their clinical techniques of retainer placement. A standard technique for retainer placement (that used by S1) was introduced⁴. The simpler 2-2 design would be used unless there was particular concern for canine stability. A further investigation should be carried out to re-audit failure rates.

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OUTCOME OF ORTHODONTIC REFERRALS AT A COMMUNITY DENTAL CLINIC

Betty Doegah, Carolyn M. Taylor, Liana Zoitopoulos, Department of Community Dental Health, Guy's, King's and St. Thomas' Dental Institute

AIMS

To assess the waiting times and outcomes for cases referred for care by different orthodontic providers.

STANDARDS

The majority of cases (>70%) should be seen within 3 months of referral to an orthodontist.

Referrals should be directed to an orthodontist on the specialist register.

AUDIT PROCESS

Case notes of 143 consecutive patients between the ages 8-15 years, referred for orthodontic treatment by community dentists at Myatt's Field Dental Clinic, were hand-pulled over a 3-week period in December 2001. Audit data was obtained retrospectively and recorded on a pre-designed data sheet. 25 cases were excluded from further detailed analysis due to incomplete records. This left 118 cases.

RESULTS

1. 52 males and 66 females were referred (44% male and 56% female)

2. 93% (110) were sent to a specialist practice

5.9% (7) to hospital

1.1% (1) to a general dental practitioner (GDP)

(See Figure 1)

3. Waiting times for the whole sample irrespective of choice of orthodontic provider varied from 1 to 42 months and the average waiting time was 7.1 months.

For hospital referrals, the mean waiting time was 11.9 compared with 6.8 months for specialist practices.

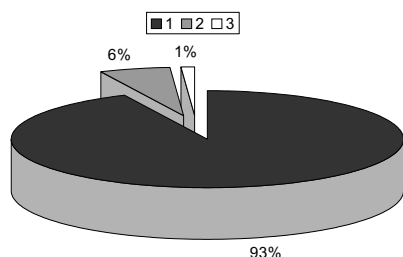
5. Only 39% (46/118) referred cases were seen within 3 months by an orthodontist compared with a minimum set standard of 70%.

6. The majority of referrals were evaluated and treated.

However 21% (25/118) cases returned to their community dentist after the initial assessment for the following reasons:

Too young (no dental extractions needed)	17
Too young (needs dental extractions)	5
Needs dental extractions (age appropriate)	1
Poor oral hygiene	2

Figure 1: Choice of orthodontic provider (1=specialist practice, 2=hospital, 3= GDP)



DISCUSSION

Community dentists at the Dental Clinic referred the majority of cases (99%) to a registered orthodontic specialist in keeping with the accepted standard of care.

Most patients were referred (93%) to a specialist orthodontic practice and the minority to hospital (6%). Factors influencing the choice of specialist practice versus hospital specialist are beyond the scope of this audit, however results suggested a shorter waiting time (less than 5 months) for patients referred to specialist practices. It is possible that the small numbers of patients referred to hospital may have resulted in an

overestimation of the overall hospital waiting time, but previous studies confirm that waiting time for treatment is a very important consideration¹. The waiting time to be seen by an orthodontist showed a wide variation as described elsewhere in the literature. It has been suggested that waiting times could be reduced by more widespread use of assessment tools such as the IOTN (Index of Orthodontic Treatment Need) to help direct referrals to the appropriate treatment provider in the first instance². Calls for agreed protocols or guidelines are not supported by evidence from a recent randomised controlled trial which concluded that orthodontic referral guidelines did not influence the behaviour of GDPs³.

A major finding was that only 39% of patients were seen within 3 months of referral, well below a set minimum standard of 70%. This result however should be interpreted with caution given the fact that the 3 months waiting time standard was reached by consensus of several orthodontists interviewed rather than hard evidence from the literature. Ideally one should aim for a 100% of patients to be seen within 3 months, we had hoped that a lower bar of 70% would be more achievable.

Another finding was that 21% of cases returned to the community dentist because they were too young and/ or needed further dental care (extractions, oral hygiene). It was not possible from the data available to make a valid and objective assessment of the appropriateness of the orthodontic referrals in the cases that returned after initial evaluation. The results of a large survey of consultant orthodontists suggests that the larger picture is that long-term manpower planning is needed to resolve the underlying issue of a shortage of trained orthodontic specialists, a process that requires time, training and resources⁴.

CONCLUSION

There is an urgent need for improvement in the speed of access to orthodontic services in the region served by Myatt's Field Dental Clinic.

PLAN FOR IMPLEMENTATION OF FINDINGS

1. Myatt's Field Dental clinic to take on the responsibility of chasing the status of orthodontic referrals by checking the status of all referrals at 2, 4 and 6 months of waiting. All case notes are to be colour-coded at the time of referral and patients telephoned to confirm whether they have been seen at 2 months. If they have not been seen, we will inform the place of their referral and re-check their status at 4 and 6 months as necessary. This has implications for staffing and may require extra resources.

2. Community dentists to improve documentation by specifically recording in notes the time when the patient was referred for orthodontic treatment and the specific reason for orthodontic referral

3. Repeat the audit after 2 years

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AN AUDIT OF THE QUALITY OF RADIOGRAPHS TAKEN IN A SPECIALIST ORTHODONTIC PRACTICE

Farnaz Parvici

INTRODUCTION

It is recognised that exposure to ionising radiation is associated with an increased risk in the long-term of malignant disease in those persons irradiated and risk of serious hereditary disease in their descendants (NRPB Guidance Notes)¹. It is therefore important to eliminate unnecessary exposure and to ensure that any radiographic examination that is undertaken has a net benefit for the patient. Radiographic guidelines state that diagnostic investigations utilising ionising radiation offers potential benefits to the healthcare of patients and are an accepted part of medical practice. Where appropriate they may also be used in teaching and research (Isaacson&Thom)².

AIMS

- 1). To assess the existing quality of the radiographs being taken in the practice.
- 2). Improvement of quality by identifying possible areas for change in practice accordingly, and assess the effects.

STANDARDS

The standard used in this investigation was based on the image quality rating system and performance targets as set by the NRPB guidance notes. These are demonstrated in Tables 1 and 2.

Table 1. Minimum targets for radiographic quality

Rating	Quality	Percentage of radiographs taken	
		Targets	Interim Targets
		Not less than 70%	Not less than 50%
	Diagnostically acceptable	Not greater than 20%	Not greater than 40%
	Unacceptable	Not greater than 10%	Not greater than 10%

Table 2. Image quality rating system

Rating	Quality	Basis
	Excellent	No errors of patient preparation, exposure, positioning, processing or film handling
	Diagnostically acceptable	Some errors of patient preparation, exposure, positioning, processing or film handling, but which do not detract from the diagnostic utility of radiographs
	Unacceptable	Errors of patient preparation, exposure, positioning, processing or film handling, which render the radiographs diagnostically unacceptable

METHOD

100 radiographs were selected at random and their quality assessed prior to the implementation of changes in the radiographic process. The quality of radiographs were given a score according to the image quality rating system used in the NRPB guidance notes as demonstrated in Table 2. When a radiograph was given a quality rating of 3 the reason was recorded. A number of changes were then made to procedure for taking and processing radiographs as follows;

- A register of each radiograph and the person responsible for taking and processing of the radiographs was started.
- A register of repeat radiographs was started. This included the date, number of radiographs repeated, the nature of the deficiency and the reason for the deficiency.
- F speed films were introduced instead of E speed films.
- With regards to the processing equipment every 14 days the old chemicals are discarded and the processing chambers are cleaned according to the manufacturers instructions. The rollers are cleaned with soapy water and then soaked in clean water for 48 hours. The chambers are then filled with new chemicals. The date of the procedure as well as the person conducting it and the date of the next cleaning process is registered.
- Two of the three nursing staff were trained and were qualified to

take radiographs. This also resulted in an increase in the general level of awareness of ionising radiation within the practice.

A second prospective study of another 100 randomly selected radiographs using the same criteria then followed.

RESULTS

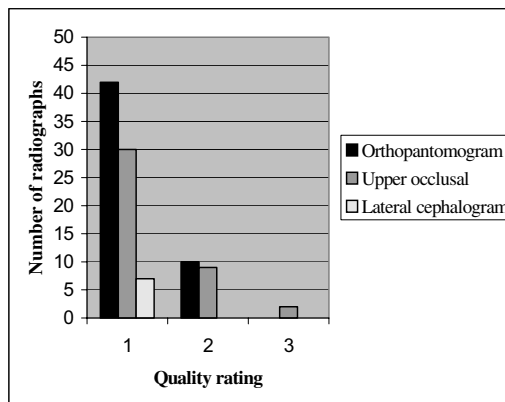
Of the 100 retrospective radiographs 52 were orthopantomograms, 41 were upper occlusal radiographs and 7 were lateral cephalograms. Table 3 demonstrates the rating of these radiographs.

Table 3 Quality rating of 100 retrospective radiographs prior to changes.

Radiographs	Quality rating		
	1	2	3
Orthopantomograms	42%	10%	
Upper Occlusal	30%	9%	2%
Lateral cephalograms	7%		

The results demonstrate that during this stage of the study 79% of the radiographs were of excellent quality, 19% were diagnostically acceptable and 2% were unacceptable and had to be repeated. One of the unacceptable cases was due to processing error during which the lead foil was inserted into the developing machine instead of the film. The other was due to an error of patient positioning resulting in a lack of detail and coning off. The distribution of the radiographs within each rating category can be seen in figure 1.

Figure 1. The distribution of each type of radiograph within each rating Category prior to changes.



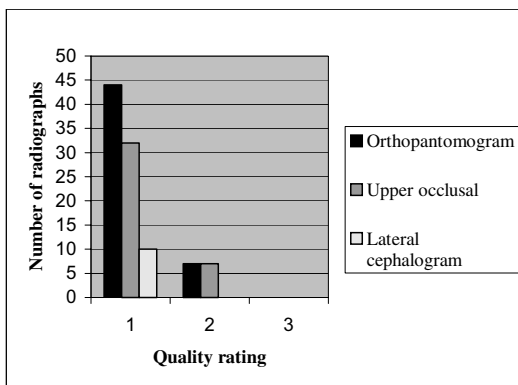
Following the implementation of a number of changes to our radiographic procedure, a further 100 radiographs were assessed and scored. Of these 51 were orthopantomograms, 39 were upper occlusal radiographs and 10 were lateral cephalograms. Table 4 demonstrates the rating of these radiographs.

Table 4. Quality rating of 100 prospective radiographs after changes implemented.

Radiographs	Quality rating		
	1	2	3
Orthopantomograms	44%	7%	0%
Upper Occlusal	32%	7%	0%
Lateral cephalograms	10%	0%	0%

The results of this stage of the study demonstrate that following the introduction of changes to our radiographic process the quality of the radiographs improved with 86% being excellent. 14% were diagnostically acceptable and there were no unacceptable cases. The distribution of the radiographs within each category can be demonstrated in figure 2.

Figure 2. The distribution of each type of radiograph within each rating category after changes implemented.



DISCUSSION

Good quality radiographs provide the greatest amount of information. It is important that the patient is correctly positioned and exposed with modern equipment which have been regularly checked and maintained. The highest speed films must be used and processed using equipment and

chemicals which are maintained and changed as appropriate. The above results demonstrate that prior to the changes implemented in practice, the targets as set by the NRPB guidelines¹ were already being met. We felt that it was nonetheless possible to improve the quality of our radiographs and the implemented changes resulted in further improvements.

CONCLUSIONS AND RECOMMENDATIONS

The existing quality of radiographs met the NRPB standards. As a result of the implementation of changes the standard of our radiographs improved further. The upper occlusal radiographs showed the most change in quality. It is important to monitor the quality of dental radiographs regularly. The audit will be repeated in six months time.

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THE QUALITY OF CLINICAL PHOTOGRAPHS

Heidi Rowland, Nikki Atack, Nick Mitchell Taunton and Somerset Hospital

AIMS

This audit was aimed to assess if photographs taken in an Orthodontic department were of an acceptable standard.

STANDARD

• A standard was set of fewer than 10% of photographs should need to be repeated on the grounds of quality.¹

PROCESS OF AUDIT

All clinicians who take photographs on a regular basis in the Orthodontic department at Musgrove Park Hospital were audited. The most recent consecutive ten sets of slides / digital images were selected from each photographer.

Each set should have consisted of:

- 2 extra-oral views (full face and profile)
- 5 intra-oral views (front view of the dentition in occlusion, left and right buccal views and upper and lower occlusal views of the dentition)

The 70 images selected from each clinician were examined by 4 assessors and an agreement was made whether the photographs were acceptable or not according to the following criteria:

- (1) Magnification
- (2) Focus
- (3) Correct patient positioning
- (4) Absence of retractors / extraneous objects

RESULTS

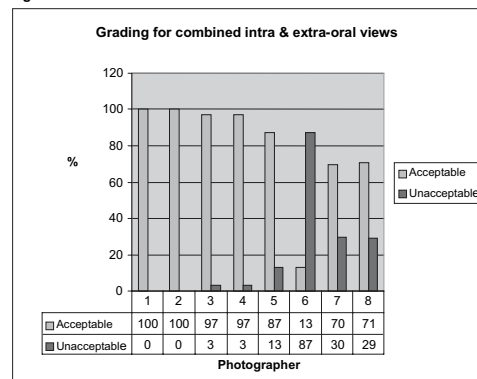
The results are presented in Table 1 and Figure 1.

Table 1. Percentage of unsatisfactory clinical photographs taken by each clinician

Photographer	Extra-oral Views	Intra-oral Views	Combined Score
1	0	0	0
2	0	0	0
3	10	0	3
4	0	4	3
5	20	10	13
6	75	92	87
7	35	28	30
8	45	22	29

Five clinicians failed to achieve the set standard for extra-oral views. Films were failed most commonly on grounds of poor magnification. Four clinicians failed to achieve the standard set for intra-oral views with the most common reason for failure

Figure 1



being incorrect magnification and poor patient positioning. Four clinicians out of the eight (50%) met the standard.

DISCUSSION

The results suggest that much of the sub-standard photography in the department is largely due to poor operator technique. The most common reasons for failure included incorrect patient positioning and incorrect magnification. The photographers who failed to meet the gold standard were all clinical assistants working in the hospital environment on a part time basis. As these clinicians do not regularly take clinical photographs this may explain in part why they failed to meet the standard.

PLAN FOR IMPLEMENTATION OF FINDINGS

- Guidance was arranged for all photographers who failed to meet the gold standard. This included a practical demonstration of photographic technique and close observation of each individual clinician whilst taking each view.
- A reference set of extra and intra-oral views deemed ideal along with written instructions in regards to the handling of the camera were displayed for reference in the department.
- Clinicians were recommended to use the digital camera as the instant play back view provides an excellent teaching aid.
- This audit will be repeated in one year.

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AN AUDIT INTO THE STERILISATION AND MANAGEMENT OF ORTHODONTIC INSTRUMENTS BY CSSD

Brian Mulgrew, David Waring, Orthodontic Department, Wirral Hospital NHS Trust

INTRODUCTION

In 2002 following the CJD scare there was a central change of policy regarding the sterilisation of instruments in hospitals¹. All surgical instruments are now required to go through a decontamination process with an initial washing¹ phase followed by vacuum autoclaving. This is carried out in Central Sterilisation Services Department (CSSD). Problems were identified with the return of orthodontic instruments from CSSD by clinicians and the dental nurses and concerns were expressed regarding the quality of the instrument packs returned from CSSD. These included incorrect instruments within each pack and damaged instruments being returned to the packs. This often resulted in further instrument packs being opened. There was also a previously unforeseen problem of turnaround time of instrument packs. These factors represented a significant extra cost to the department.

AIMS

To assess the sterilisation management of orthodontic instruments. Identify the factors relating to the quality of packing of the instruments and labelling of the instrument packs. Implement changes to sterilisation procedure and assess changes.

STANDARDS

- All instrument packs should be correctly labelled
- The correct number and designation of the instruments in all packs
- All damaged or defective instruments in packs should be repaired or replaced

AUDIT PROCESS

A two-part process with initial audit followed by a re-audit one year later to close the circle. A pro-forma was designed to score required information. All instrument packs were identified over an 8-week period (Jan - Feb 2003). Mis-labelled packs, incorrect instrument placement and defective instruments were recorded. The total number of instrument kits used was recorded. The audit was repeated 1 year later to assess the effects of changes recommended following the preliminary audit.

RESULTS OF 1st AUDIT

The numbers of instrument kits from CSSD examined, just prior to clinical use, are listed below;

- 50 band/debond kits
- 18 flat plastic & spatula kits
- 170 (round) fixed adjustment kits
- 20 Adams pliers
- 10 Mauns cutter single instrument packs

The total number of faults within each kit is shown in figure 1. The specific fault as a % of the overall faults is shown in figure 2.

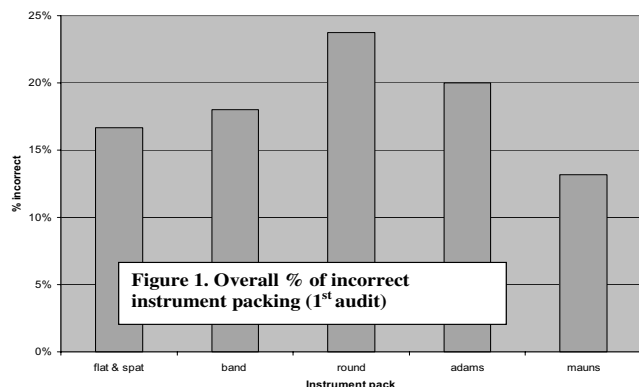
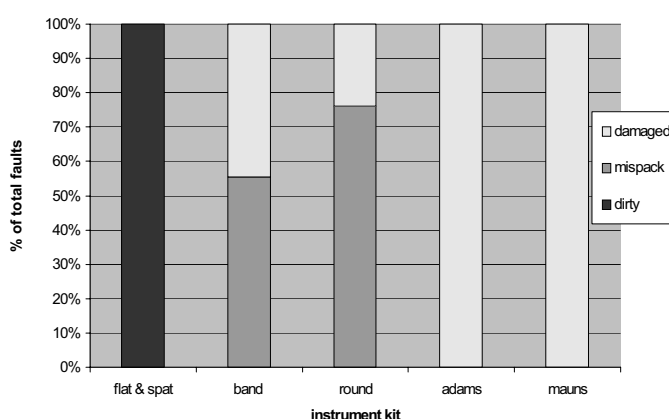


Figure 2. Category of fault within each group



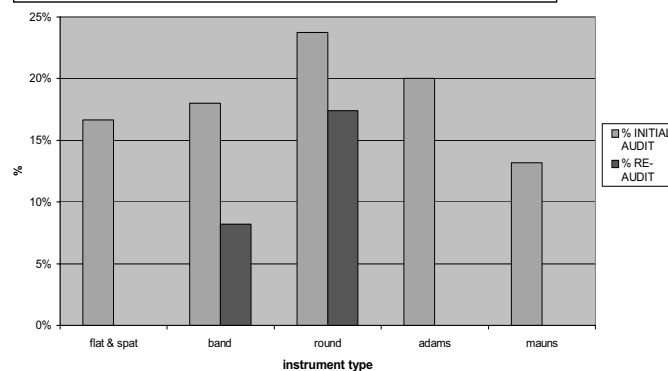
DISCUSSION

The switch to central processing was sudden as opposed to phased. It became clear after the implementation of government policy that the procedural and resource issues had not been fully thought out at a local level. The greatest number of faults appeared to affect the 'round' kits containing the instruments required for a fixed appliance adjustment. This is probably because these are the most often used and contain several instruments easily mistaken for those used by other specialities (e.g. Mosquitos and Ligature cutters). A visit to CSSD revealed that all instruments from several specialities within the hospital were pooled for the washing process and then repacked in CSSD for sterilisation. This was undoubtedly a factor in the large numbers of identification errors with instrument placement in kits.

The spatula and flat plastic kits were often returned contaminated with retained cement. The faults relating to the single instrument sets (Adams and Mauns pliers) were due mainly to inadequate oiling at sterilisation. Other faults in the instrument kits included failure to identify defective instruments, for instance corroded, broken or with stiff hinges prior to packing.

COMPLETION OF AUDIT CYCLE AND CONCLUSIONS

Figure 3. Overall % faults from initial and repeat audit



IMPLEMENTATION OF CHANGES

Following the results of the 1st audit changes were recommended as follows:

- 1) Further information and education was given to the CSSD department regarding identification and condition of instruments on packs. Photographic templates of kits were given and the oiling policy reviewed.

2) Management were acquainted with the considerable cost of replacing instruments.

3) Hand cleaning was instituted at CSSD for instruments used with cements

4) Cessation of pooling and introduction of tray system to ensure the same instruments remain on trays throughout the sterilisation process. Packing undertaken in the department prior to kits going to CSSD

5) Purchase of additional kits to accommodate turnaround time in CSSD

The number of faults during the second audit, compared to the initial audit, is shown in figure 3. The initial audit revealed a 21% overall error. The repeat audit showed 8% overall error indicating a significant improvement following the implementations. The faults were mainly related to mislabelling of kits or stiffness of the orthodontic instruments.

Further reinforcement regarding the correct packing of

instrument kits has been given within the department to ensure the improvements are maintained. The oiling of instruments remains a problem and requires further review with the CSSD. Instruments are replaced when identified as faulty or missing, following reporting either from CSSD of the clinic. Audit will be repeated periodically to ensure implementation and further improvement is achieved.

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Tooth size discrepancies and Bolton ratios

Helen Griffiths

This literature review was presented as part of the requirement to sit the Intercollegiate Specialty Fellowship Exam. The ISFE qualification distinguishes SpR's at the end of their higher training in readiness for appointment to a consultant post.

Introduction

Achieving a good occlusion requires that the maxillary and mandibular teeth are proportional in size. It has been suggested, therefore, that a tooth size analysis should be carried out routinely prior to orthodontic treatment, so as to identify tooth size discrepancies (TSDs)¹. Bolton² developed two ratios for estimating TSD by measuring the summed mesiodistal widths of the mandibular and maxillary anterior teeth (77.2%) and the total width of all lower to upper teeth up to and including the first molar (91.3%). In a subsequent paper, Bolton³ also recommended the use of different overall ratios for premolar extraction cases.

Tooth size discrepancies

The prevalence of TSD in the general population has been quoted as 5%¹. The basis for this figure was not fully explained and may simply be the proportion of cases that fall outside 2 Standard Deviations (SD) from Bolton's mean ratios. However, within a pre-treatment orthodontic population, the number of individuals with significant TSD (*i.e.* 2 SD above or below Bolton's mean) has been found to be much higher at 30.6% for an anterior TSD and 13.4% with an overall TSD⁴. This would suggest that a high proportion of cases will cause difficulty due to the disproportionate size of the teeth, but this is not reflected clinically, with far fewer cases seeming to have such difficulties. These apparent disparities in the prevalence of TSD merit further analysis. Investigations of the prevalence of TSD in the different malocclusion groups have also produced varying results, with mandibular tooth excess found in class III malocclusions^{5,6,7} and maxillary excess in class II malocclusions⁶ in some investigations and yet others finding no such differences^{8,9}.

Validity of the Bolton ratios

Bolton's² original research was carried out on 55 cases with excellent occlusions, the majority of whom (44 cases) had undergone orthodontic treatment. The population and gender composition of the sample group is not specified, neither is the malocclusion type. The exclusive use of cases with good occlusions is sensible for determining an ideal average ratio, but is inappropriate for quantifying variation in an orthodontic population. This limitation of Bolton's sample explains the previously noted high proportion of patients presenting with ratios beyond 2 SDs of Bolton's mean ratio⁴. Other studies have investigated the anterior and overall ratios^{4,9-15} using larger sample groups and although the average ratios have been close to Bolton's values¹⁴, in general they are larger (mandibular tooth excess) and with higher standard deviations. It has also been suggested¹⁰ that Bolton's² mean ratios are more applicable to white females because the values found in this group¹⁰ most closely matched Bolton's ratios² and most orthodontic patients during the 1950's were from this group. Thus, the ratios should probably not be applied indiscriminately to white males, blacks and other racial groups^{10,16}.

In his second paper, Bolton³ discussed the effect of premolar extractions on the overall ratio and stated that after the extraction of four premolars, patients in whom no TSD existed would have an overall ratio of 87-89%. It is also worth noting that not all papers have picked up on this recommendation and have continued to use his original overall ratio when looking at extraction cases¹⁵. Bolton³ suggested that the occlusion in extraction cases may be improved by the removal of a mandibular premolar that is larger than the maxillary premolar. In fact, extractions may improve or worsen TSDs¹⁷. Extraction of all four first premolars produced statistically significant TSDs, whereas extraction of the second premolars reduced any discrepancy that had existed prior to treatment¹⁷. The difference was mainly due to the size of the lower second premolar because most discrepancies occurred as mandibular excess in relation to the Bolton mean ratio.

Methods of measurement

The traditional methods of measuring mesiodistal widths of teeth have been with either needle-pointed dividers^{2,18} or a Boley gauge (Vernier calipers)^{18,19}. Clinically significant measurement errors have been shown to occur when analyses are carried out on casts with more than 3mm of crowding¹⁸. This throws into doubt the accuracy of many pre-treatment assessments of TSD, where there is 3mm or more crowding. More recently, digital calipers linked to computers or alternatively, scanned images of the study casts which are measured on-screen have been introduced^{19,20}. The advantage of these methods is that they are considerably faster than manual methods^{19,21} and instantly display the amounts of tooth size adjustment required to obtain Bolton's mean ratio¹. Factors such as sex, race and extraction pattern can be built into the database.

Clinical relevance

There are certain teeth that show greater variance in size and these teeth should be examined first when an interarch TSD is suspected (6s, 5s, mandibular 1s and maxillary 2s)¹⁰. However, when artificially simulated TSDs were introduced on laboratory set-ups, it was still possible to achieve a passable class I relationship even in severe TSD cases (12mm of tooth tissue removed from one arch) and PAR-values were only modestly affected¹⁵. This innovative and interesting study suggests that TSDs have less effect on the final occlusal result than previously thought, but this may also reflect some of the known insensitivities of the PAR index²² and also the limitations of laboratory setups.

Conclusions

It appears reasonable that a ratio must exist which permits an ideal relationship between the upper and lower teeth and the Bolton mean¹ is probably a good guide, particularly in white females. Ideally, race and sex-specific values need to be calculated. However, what still remains very uncertain is how much deviation from this mean ratio is required for a clinically significant effect. The situation is further complicated by extractions. Computerised analysis enables rapid - and therefore more frequent - measurement of TSD. The absolute size of TSD has been under emphasised in relation to a corresponding variation in ratio. A potentially informative study would compare the prevalence of TSD in patients with very acceptable occlusal outcomes post-treatment and patients with a poor result. This would give a better perspective both to the relative importance of TSD as a factor in poor occlusal results, and also to the size of TSD, which is of clinical significance.

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EDITOR'S CUT

Dear Readership, this year sees a change of name and direction for the newly renamed Bulletin. The introduction of the peer review process brings new depth and credibility to this publication which has served us well in its thirteen year history. The FTTA's have taken to their task of refereeing the articles with a vigour and thoroughness that are a credit to them as senior trainees and future consultants. Authors can have the satisfaction of knowing their articles are published with the backing of their peers.

This year also sees an even better crop of articles covering a broad range of subjects. It is indeed gratifying to receive submissions from specialist practice and the community dental service, showing that hospital departments are not the only preserve of structured and written up audit projects. The portfolio would indeed be complete if colleagues in general dental practice were to submit for next year's issue.

Those of you who heard John Turner's lecture on the website at this year's BOC will know that the Bulletin and back issues of the Newsletter are now available on the website. Up to now the series is not quite complete but thanks to Hugh Bellis and Nigel Taylor answering our appeal, the elusive 1997 and pre 1995 issues are now found. These will be added to the archive in the coming weeks to make the series complete. To view the archive, go into the Members' section, click on BOS committees, then click on Clinical Effectiveness. On this page the link is near the top of the page and called 'Audit Newsletter Archive'. An index is available and each volume as a PDF file.

The deadline for submission for the 2005 issue of the Bulletin is 1st July 2005. Guidelines for authors are available from the address below and submissions should be sent to the same address. There are already submissions in the pipeline and I look forward to hearing from more aspiring authors, preferably by email.



Gavin Barry
Editor CEC Clinical Effectiveness
Bulletin
Orthodontic Department
Arrowe Park Hospital
Upton
Wirral
Merseyside CH60 8PB
gavin.barry@whnt.nhs.uk