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Supplementary file

Supplementary Table 1: Free text comments about IOTN

Experience of IOTN
<i>"Used it in orthodontic department a few times while referring to IOTN guidance "</i>
<i>"On paediatric new patient clinics as part of the child's treatment plan"</i>
<i>"On orthodontic clinic, do it every time we do an orthodontic assessment form, find it easy"</i>
<i>"Only on peads and ortho. 4/5 different patients Hard with some classifications e.g. slightly increased is that class 2 or because its slightly just class 1 etc "</i>
<i>"An orthodontic assessment was carried out, I have used it about 4 times on orthodontic clinics, it was easy except for the RCP-CO"</i>
<i>"Paediatric clinic, easy to use, used 10+ times"</i>
<i>"Used on paedes and ortho clinic around 4 times Found it challenging at first but becoming easier"</i>
<i>"Once, it was straight forward because the case was simple"</i>
<i>"Less than 5 times, on orthodontic clinics"</i>
<i>"Used several times in group work seminars and on the Orthodontic Clinics "</i>
<i>"Less than 5 times on orthodontic clinic "</i>
<i>"Used it twice on paediatric clinics. It was a bit difficult as I needed the tutor's help with confirming the score"</i>
<i>"On paedes clinic"</i>
<i>"Used it once on an Ortho referral with the sheet next to me "</i>
<i>"Twice on paediatric and orthodox clinics"</i>
<i>"Once, difficult, on paedes"</i>
Confidence in applying IOTN
<i>"Majority of times with a case I understand and can give accurate answers"</i>
<i>"I understand it but I have to learn it still to feel confident"</i>
<i>"Not 100% yet, I still struggle and have to refer to my notes for the molar and canine relationships"</i>
<i>"I understand the IOTN assessment but would need the sheet prompt. "</i>
<i>"I have not used it before in a clinical setting."</i>
<i>"I understand the theoretical use but have never practically applied this"</i>
<i>"Not from memory !"</i>
<i>"Haven't done it in a while but think I could have a go"</i>
<i>"Relatively confident - happy to have a go then have a tutor confirm "</i>
<i>"Because I have never used it in a clinical setting, and I find it so complicated to use"</i>
<i>"Never used it "</i>
<i>"Some case discussion or observation might boost the confidence "</i>
<i>"It was not properly taught; I feel it was mostly self-learning. To myself I feel if the IOTN introduced to clinic it will be more Beneficial and practical and we will feel more competent of doing it. "</i>
<i>"We have only recently begun ortho teaching "</i>

"Not enough clinical experience "

"Think I would need clinical practice to feel more confident "

"School has offered a one-day shadowing placement with orthodontist and relevant lectures; but no/rare clinical experience so far and I haven't given much attention to this area."

"It is a little bit complicated"

"I find it a bit confusing when more than one aspect is involved in determining the score."

"I think its quite subjective the whole assessment"

"We just slightly touched on it, since this semester was just online classes and we haven't had the opportunity to see patients yet."

"I'll feel more confident with any information delivered once I apply it clinically. If we experience paediatric clinics weekly and perform IOTN assessment weekly with each new pt exam, the Theoretical information will be imbedded "

"Happy to do IOTN with the criteria sheet next to me but not without it"

"I have had no experience applying this in a clinical setting, I believe the more I apply it the more familiar I will become with it "

Supplemental Table 2: Free text comment about confidence in making orthodontic referrals

Confidence in making an orthodontic referral
<i>"I have never done it before, therefore I am not confident in what to do."</i>
<i>"From what I understand, early referrals are made for patients eligible for interceptive orthodontics. Other patients should be referred from around age 8 if their IOTN fits the NHS."</i>
<i>"Difficult to decide. I feel I will refer all patients for orthodontic advice due to limited knowledge"</i>
<i>"Although we had the relevant teaching, there's a lack of experience regarding ortho assessment and referral. "</i>
<i>"I feel I could identify when a patient would need to be referred but not confident in deciding what I'm referring for and who to."</i>
<i>"Clinical application of orthodontic assessment and referral would allow me to confidently refer patients to receive the required treatment."</i>
<i>"Haven't completed a referral and would get advice from my tutor."</i>
<i>"More clinical experience and familiarity with systems and paperwork is required."</i>
<i>"No, we weren't taught what the referral procedure is and the different referral pathways."</i>
<i>"Because I have never used it in a clinical setting, and I find it so complicated to use"</i>
<i>"Never used it."</i>
<i>"Completed a referral once, found it challenging and did not know what to include."</i>
<i>"Not a lot of detail. I know that non-MDT cases can be referred to high-street/primary care orthodontic practices whereas MDT would have to be treated in a hospital setting. However, there is a grey area in between and I am guessing that this would depend on local criteria."</i>
<i>"We have been taught to refer but not where."</i>

Supplementary material: Full copy of online questionnaire

Dental undergraduates' ability and confidence in applying IOTN

Introduction

We are two fifth year dental students at the University of Leeds. We are undertaking some research for our MChD and would like to invite you to take part. Below is some information about our research.

What is the purpose of this study?

The Index of Orthodontic Treatment Need (IOTN) is used to evaluate the need for orthodontic treatment in the UK. Our study hopes to find out how confident students are in applying the IOTN for different malocclusions, and then deciding if and where to refer.

Who is being asked to participate?

Fourth and fifth-year dental students from UK universities.

What will be involved if I take part in this study?

You will be asked to complete an online questionnaire. This will take around 10 minutes and your answers are anonymous. The questionnaire contains 6 cases with different malocclusions. We have provided the IOTN descriptors for you.

What are the advantages and disadvantages of taking part?

The questionnaire will provide an opportunity to tell us about your experience of using the IOTN. It may also be a practice in using IOTN and thinking about how/where to refer patients.

The questionnaire may take you some time to complete, around 10 minutes. You might feel a lack of knowledge in the subject area. For this reason we have provided some useful orthodontic learning resources from the British Orthodontic Society.

Can I withdraw from the study at any time?

You can withdraw up to the point before completing and submitting the questionnaire. After this withdrawal **will not be possible** as data is anonymised and it is not possible to locate your response.

Will the information obtained in the study be confidential?

- Data will be collected by the survey tool and automatically anonymised.
- No personal data will be collected from you.
- Data will be stored on a University of Leeds secure drive with automatic backups for 3 years, and then destroyed.
- Data will be accessed by the researchers and the supervisor but not shared with anyone else.
- All answers will be confidential.

What will happen to the results of the study?

The researchers plan to publish this study in a peer-reviewed journal. You are welcome to contact the researchers if you would like to find out the results.

Who has reviewed this study?

Ethical approval was obtained from the Dental Student Ethics Committee (DSEC), University of Leeds prior to data collection.

**Thank you for taking the time to read about our research.
We hope you can take part.**

For questions or concerns about the study please contact:

Researchers

- Lina Almuraikhi, Fifth-year University of Leeds dental student Fy15lyas@leeds.ac.uk
- Sherouq Bouskandar, Fifth-year University of Leeds dental student Fy15syb@leeds.ac.uk

Project Supervisors

- Dr. Sophy Barber, NIHR Clinical Lecturer in Orthodontics S.K.Barber@leeds.ac.uk
- Mr Trevor Hodge, Consultant and Honorary Clinical Associate Professor in Orthodontics T.M.Hodge@leeds.ac.uk

Eligibility and consent

I am a 4th or 5th year dental student in the UK.

Yes / No

I have read the information about the study and I am happy to take part.

Yes/ No

(If participants answer 'No' they will be directed to the exit page)

About this survey

There are four sections in this survey:

1. A bit about you – We do not ask for any personal information.
2. Your orthodontic teaching and experience.
3. Six cases with a range of malocclusions. We ask you to give an IOTN Dental Health Component score and to decide whether/where you would refer the person for orthodontic treatment.
4. Places to get further information and the opportunity to leave your email for a chance to win one of 10 Starbucks vouchers

About you

1. Please select the university you attend
(Drop down list)
2. Please select your current year of study
Fourth year
Fifth year
3. Will you be working in the UK or overseas after qualifying?
Training in the UK
Training Overseas *(Please state the country)*

Orthodontic teaching and experience

1. What type of orthodontic teaching have you received so far? (Please select all that apply)
 - Lectures or e-lectures
 - Seminars with cases
 - Clinical observation
 - Clinical experience of performing orthodontic examination
 - Clinical experience of providing orthodontic treatment
 - Other - please specify (text box)
2. Which year of your dental degree did orthodontic teaching start?

- Year 1
- Year 2
- Year 3
- Year 4
- Year 5

3. How familiar are you with IOTN?

- Not at all familiar
- Slightly familiar
- Moderately Familiar
- Very familiar
- Extremely familiar

4. Have you ever used the IOTN scale in a clinical setting?

Yes/No

5. If answered **yes**, what is your experience using IOTN in clinical settings?

6. In general, are you confident completing an IOTN assessment?

Yes/ No

Please feel free to tell us more (*free text box*)

7. How familiar are you with different orthodontic referral pathways?

- Not at all familiar
- Slightly familiar
- Moderately Familiar
- Very familiar
- Extremely familiar

8. Have you ever completed an orthodontic referral?

Yes/No

9. If answered **yes**, what is your experience of referring a patient for orthodontics?

10. Have you received teaching about referring a patient for orthodontic advice or treatment?

Yes / No

Please give details (*free text box*)

11. In general, are you confident in referring a patient for orthodontic advice or treatment?

Yes / No

Please feel free to tell us more (*free text box*)

Cases

The following pages will contain 6 cases with different malocclusions.

For each case you will be provided with

- Digital study models
- An OPT
- Standardised information that may be needed to identify the IOTN Dental health component

An IOTN chart published by British Orthodontic Society was provided as a PDF in the invitation email. You are free to use this to help you.

Questions with each case

1. What do you think is the most appropriate IOTN for this case? *(free text box)*
 - Please feel free to explain your choice

2. How confident are you in your chosen IOTN score for this case?
 - Not confident at all
 - Slightly confident
 - Somewhat Confident
 - Fairly confident
 - Completely confident

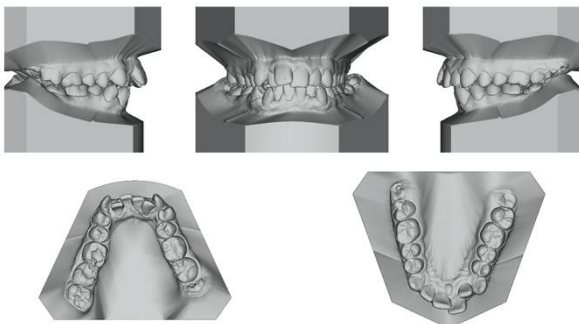
3. Would you refer this patient for orthodontic treatment?
 - Yes / No
 - Please feel free to explain your answer *(free text box)*

4. If you felt the patient needed orthodontic treatment, where would you refer them?
 - Level 1
 - Level 2: Practitioner under orthodontic specialist supervision
 - Level 3a: Orthodontic specialist
 - Level 3b: Consultant Orthodontist in secondary care
 - Referral not required
 - I don't know

5. When would you refer?
 - Immediately
 - In the future
 - Please feel to explain your answer *(free text box)*

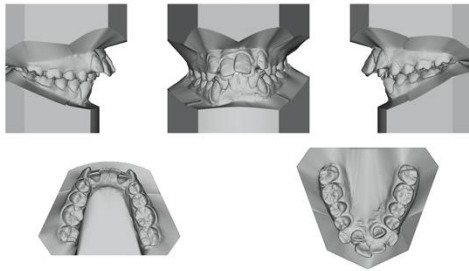
6. How confident are you with this referral choice?
 - Not confident at all
 - Slightly confident
 - Somewhat Confident
 - Fairy confident
 - Completely confident

Case 1



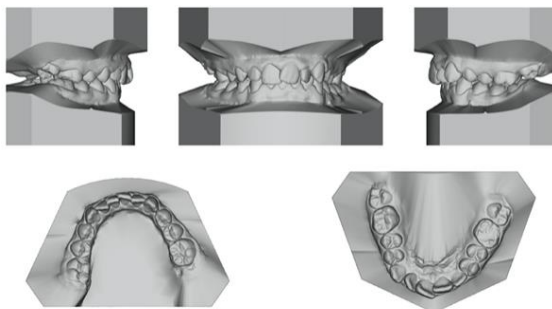
Patient concern	Feels like teeth are not straight.
Medical history	Fit and well.
Dental history	Good oral hygiene. Well-controlled diet. Regular attender.
Age	17
Reported functional difficulties	Incompetent lips
Mandibular displacement	None
Maximum overjet	9mm
Maximum open bite	n/a
Maximum contact point displacement	7mm

Case 2



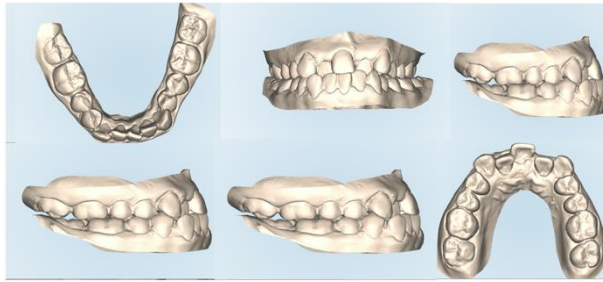
Patient concern	Patient not confident smiling, difficult to clean
Medical history	Fit and well
Dental history	Good oral hygiene. Well-controlled diet. Regular attender. Previous RCT to UL1 due to trauma.
Age	14
Reported functional difficulties	Incompetent lips,
Mandibular displacement	None
Maximum overjet	14mm
Maximum open bite	1mm
Maximum contact point displacement	9mm

Case 3



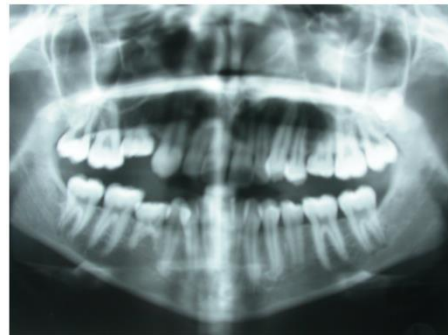
Patient concern	No concern
Medical history	Fit and well
Dental history	Good oral hygiene. Well-controlled diet. Regular attender.
Age	13
Reported functional difficulties	None
Mandibular displacement	None
Maximum overjet	6mm
Maximum open bite	n/a
Maximum contact point displacement	4mm

Case 4



Patient concern	Not happy with their smile.
Medical history	Fit and well
Dental history	Good oral hygiene. Well-controlled diet. Regular attender.
Age	14
Reported functional difficulties	None
Mandibular displacement	None
Maximum overjet	1mm Reverse overjet 3mm
Maximum open bite	n/a
Maximum contact point displacement	4.5mm

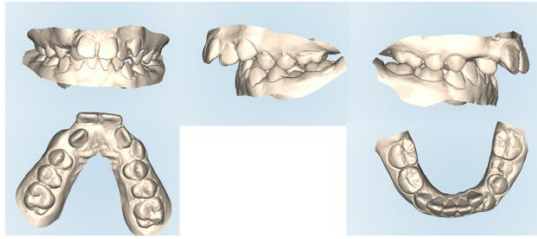
Case 5



Patient concern	Patient bullied at school for their smile.
Medical history	Fit and well.
Dental history	Good oral hygiene. Well-controlled diet. Regular attender. UR1 RCT with previous trauma.
Age	13
Reported functional difficulties	None
Mandibular displacement	None
Maximum overjet	12mm
Maximum open bite	n/a
Maximum contact point displacement	7mm

During manuscript preparation an error in the information given was identified (maximum overjet 12mm). The overjet was 2mm, as evident in the study models.

Case 6



±

Patient concern	Patient bullied at school for their smile.
Medical history	Fit and well.
Dental history	Good oral hygiene. Well-controlled diet. Regular attender. UR1 RCT with previous trauma.
Age	13
Reported functional difficulties	None
Mandibular displacement	None
Maximum overjet	12mm
Maximum open bite	n/a
Maximum contact point displacement	7mm

Prize draw

Thank you for completing our survey.

If you would like to be entered into the prize draw to win one of ten £10 Starbucks vouchers please leave your email here. This will not be shared and will only be kept until the prize draw. Email addresses will be kept separately from questionnaire answers.

Thank you

If you would like further assistance with IOTN identification and referrals the following links by the British Orthodontic Society and the NHS Orthodontic Commissioning Guidelines are useful:

<https://www.bos.org.uk/Information-for-Dentists/Quick-Reference-Guide-to-Orthodontic-Assessment-and-Treatment>

<https://www.bos.org.uk/Portals/0/Public/docs/Information%20For%20Qualified%20Dentists/Referral%20guidelines%20images.pdf>

<https://www.england.nhs.uk/commissioning/wp-content/uploads/sites/12/2015/09/guid-comms-orthodontics.pdf>

Thank you for your time and effort in completing this questionnaire.

If you have any questions or would like to raise any concerns, please contact the researchers on the email addresses below:

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