Orthodontic Needs Assessment: South-East Wales

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1. Abbreviations

Abbreviations

<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC of IOTN</td>
<td>Aesthetic Component of the Index of Treatment Need</td>
</tr>
<tr>
<td>CDS</td>
<td>Community Dental Service</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence Interval</td>
</tr>
<tr>
<td>DHC of IOTN</td>
<td>Dental Health Component of the Index of Treatment Need</td>
</tr>
<tr>
<td>dmft</td>
<td>Number of decayed, missing, and filled baby (deciduous) teeth</td>
</tr>
<tr>
<td>DMFT</td>
<td>Number of decayed, missing and filled permanent teeth</td>
</tr>
<tr>
<td>DT</td>
<td>Active and untreated decay that extends into the dentine of a permanent tooth</td>
</tr>
<tr>
<td>GDP</td>
<td>General Dental Practitioner</td>
</tr>
<tr>
<td>GDS</td>
<td>General Dental Services</td>
</tr>
<tr>
<td>IOTN</td>
<td>Index of Orthodontic Treatment Need (used for identifying objective treatment need)</td>
</tr>
<tr>
<td>LHB</td>
<td>Local Health Board</td>
</tr>
<tr>
<td>MCN</td>
<td>Managed Clinical Network</td>
</tr>
<tr>
<td>Mins</td>
<td>Minutes</td>
</tr>
</tbody>
</table>
2. Executive summary

With limited resources available for dentistry, it is imperative that the Local Health Boards plan the provision of orthodontic services based on treatment need in the context of the oral health of their resident population.

Current provision of orthodontic treatment is based on historical provision prior to the introduction of the new dental contract. The waiting time for orthodontic assessment and treatment in the GDS/PDS in South-East Wales is long. This gives the impression that the current provision of orthodontic services is well short of treatment need of its child population. Hence, the aim of this project was to compare current orthodontic service provision to the treatment need of the child population in South East Wales.

There is no single standardised scientific method for calculation of orthodontic treatment need of a population. The method used in this report is based on currently available evidence and mid-year 2007 population estimate. This report should be reviewed as and when more evidence becomes available.

As per our calculations, current GDS/PDS and CDS/HDS provision of orthodontic services in South-East Wales seems adequate to address the treatment need of the child population (Table A).
Table A: Comparison of orthodontic treatment need and provision in South-East Wales.

<table>
<thead>
<tr>
<th>Estimated Orthodontic Treatment Need</th>
<th>The GDS/PDS provision</th>
<th>Estimated Hospital/CDS provision</th>
<th>Total orthodontic provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>5547</td>
<td>4594</td>
<td>817 + provision at the dental hospital</td>
<td>5411+ provision at the dental hospital</td>
</tr>
</tbody>
</table>

Currently, the access to the orthodontic services is largely demand led rather than based on needs. This has created a long waiting time for patients to see a GDS/PDS orthodontic provider/performer.

The following listed reasons could be contributing to the long waiting time in primary care.

- High number of referrals/assessment of patients who do not qualify for NHS orthodontic treatment i.e. with IOTN 1, 2 and 3 with aesthetic component (AC) < 6.
- Multiple referrals of the same patient to different orthodontic providers
- High number of premature referrals resulting in high number of assessment and reviews
- Inaccurate record and reporting of waiting lists.

The main priority of the LHBs must be improvement of the dental health of their population. This involves ensuring that access to the GDS services is sufficient as well as equitable and effective preventive services are in place. Hence, further expansion of the orthodontic services in the current resource limited system can not be justified.

LHBs in South-East Wales should collaborate with each other, dental public health team and orthodontic providers:
a) to monitor the quality of orthodontic services provided in the region and

b) to make the system more efficient.

This will ensure that those children who need and qualify for the NHS orthodontic treatment receive treatment without delay. The Managed Clinical Network (MCN) in Orthodontics may provide a platform to test ideas and formulate a plan to make the system efficient.

3. Introduction

In England and Wales, new contractual arrangements were introduced for the NHS dentistry in April 2006. The new system allocates finite resources to each Local Health Board (LHB) for the provision of the dental services in its area. Hence, in this new cash-limited arrangement, the LHBs need to assess the oral health needs of their population and provide need-based dental services. The fundamental aims of these services are to improve oral health and reduce oral health inequalities.

Orthodontics is the branch of dentistry concerned with the development of the teeth, jaws and face and management of any deviations from ‘normal’ (malocclusion). Malocclusion is not a disease but simply a marked variation from what is considered to be ‘normal’. Orthodontic treatment is carried out to improve the appearance, position and function of the crooked or abnormally arranged teeth.

In Wales, the NHS orthodontic services are currently provided by hospital and the Community Dental Services as well as independent orthodontic providers who hold General Dental Service (GDS)/Personal Dental Service (PDS) contracts with the LHBs. The majority of orthodontic treatment is carried out in children under the age of eighteen years in the GDS/PDS. In this document, this age group will be described as children and remaining age group (age of 18 years and over) will be described as adults.
Current provision of orthodontic treatment is based on historical provision prior to the introduction of the new dental contract. The waiting time for orthodontic assessment and treatment in the GDS/PDS in South-East Wales is long. This gives the impression that the current provision of orthodontic services is well short of treatment need of its child population. **Hence, the aim of this project was to compare current orthodontic service provision to the treatment need of the child population in South East Wales.**

With limited resources available for dentistry, it is imperative that the LHBs plan the provision of orthodontic services based on treatment need in the context of the oral health of their resident population.

Public and patients should be engaged and consulted to find out their priorities among various dental needs. A recent survey\(^1\) in Wales found that the public perceived dental check ups, emergency dental treatment more important than orthodontic and cosmetic treatment. This study suggests that the public understand the need for prioritisation within dentistry.

The proposed re-organisation of the NHS in Wales provides the new LHBs with an opportunity to re-assess the existing dental services, prioritise and re-orientate them according to the needs of their population. Findings from the ongoing oral health equity research and local/regional oral health needs assessments should form the basis of such change.

The LHBs should also engage and consult the orthodontic profession. The orthodontic profession in the region has initiated the process of formation of the Managed Clinical Network (MCN). The LHBs should work with the network to provide high quality of orthodontic care in the region.

The LHBs should also be aware of ongoing work of Task and Finish Group set up by the Minister for Health and Social Care. The main challenge for the LHBs will be to make necessary changes within the existing financial and regulatory constraints.
4. Factors Affecting Orthodontic ‘Treatment Need’ and Service Provision

Index of orthodontic treatment need (IOTN) is used in the NHS to identify the patients who will benefit from orthodontic treatment. The IOTN classification system is explained in more detail in Appendix 1. It is generally accepted that children with IOTN 4 and 5 have potential for significantly benefit from orthodontic treatment.

Under the new dental contract, children under the age of 18 years and following IOTN categories qualify for the NHS orthodontic treatment.

- IOTN 4 and 5
- IOTN 3 with Aesthetic component (AC) of 6 or higher.

In secondary care, in addition to children under the age of 18 years, adult patients who require multidisciplinary treatment are also provided orthodontic treatment.

IOTN defines orthodontic treatment need from a clinician’s point of view (normative need) with less emphasis on the perception of the patient/parents or impact of malocclusion on patients. Studies have shown the discrepancy between clinician defined treatment need and perceived need\(^2,^3\). Some authors have suggested combining IOTN with subjective measures like Quality of Life to identify orthodontic treatment need\(^4,^5,^6\). Nevertheless, IOTN is the index of choice in the NHS to identify orthodontic treatment need in the population.

Normally only decay free patients, who have good oral hygiene, are deemed suitable for orthodontic treatment. Twenty nine percent of twelve year-old children in South-East Wales have active and untreated dentinal decay on their permanent teeth.

Orthodontic services are provided on a referral basis. Patients need to see a dentist first for referral to an orthodontist. About two thirds of children aged less than 18 years had visited a dentist in the previous 24 months\(^7\), prior to September 2008.

Current provision of orthodontic services in the South-East Wales is based on historical treatment carried out in the region prior to introduction of the new dental
contract in April 2006. The majority of the orthodontic services are provided in Cardiff. Similar to general dental services, current orthodontic service provision was not based on needs assessment or equity audits.

Orthodontic treatment needs of a population and service provision cannot be considered in isolation. Such assessment should be understood in the context of overall oral health of the population. Hence, the provision of orthodontic services should be guided by the ‘treatment need’ of the population and prioritised in the context of other competing dental services. Other competing dental services include mandatory and additional dental services, oral health prevention, restorative dental services, dental general anaesthesia services and other services provided through community and hospital dental services.

Oral health of the children in some parts of South-East Wales is one of the worst in the UK. The level and severity of dental decay in these children and level of care provided is unacceptable. The LHBs are responsible for addressing and prioritising these issues. Hence, there is a constant pressure on the LHBs to invest in preventive services and improve access to general dental services. This will have an impact on the provision of orthodontics, especially in terms of further expansion/growth.

Availability of the orthodontic workforce also affects the provision of services. Analysis of the orthodontic workforce in the South-East Wales was outside the scope of this project. However, comments from some providers suggest that there is capacity within the GDS/PDS services to cater for more orthodontic services if required.

5. How is Orthodontic Treatment Need Measured?

The majority of the orthodontic treatment is carried out when all permanent teeth have erupted. Prevalence of malocclusion in the twelve year-old population is commonly used as a reference for quantifying orthodontic treatment need in the child
population. Reported objective orthodontic ‘treatment need’ in the child population has remained similar for many years.

- Brook and Shaw (1989)\(^8\) reported that 39% of the 11-12 year population had DHC 4 or 5 or DHC of 3 with AC> 6.
- Holmes (1992)\(^9\) reported that 36.3% of children had an IOTN 3 and an AC of 6 or higher. A further 4% were wearing orthodontic appliances.
- Stephens (1992) used a prediction method based on twelve year old population to calculate orthodontic treatment need\(^10\). According to his method, one third of 11-12 year-old children will fall under IOTN 4 and 5. Stephens has also factored in the interceptive orthodontic treatment and adult orthodontics into his formula which is as follows

\[
\text{Normative orthodontic need} = \frac{\text{Population of 12 year olds} \times (100+\text{interceptive factor}+ \text{adult factor})}{3^* \times 100}
\]

Adult factor = 4 and Interceptive factor = 9

*based on one third of 12 yr old population with need for orthodontic treatment

- The Stephen’s formula can be modified by taking adult factor out, if one is considering treatment need only in the child population.
- Burden and Holmes (1994) reported that, based on IOTN, approximately one third of 11-12 years-old children in the UK would greatly benefit from orthodontic treatment\(^11\). A further 5% were wearing orthodontic appliances.
- The National Child Dental Health Survey (2003)\(^12\) found that 35% of twelve year-old children in the UK had an IOTN DHC of 4 or 5 and an Aesthetic component (AC) of 8-10. A further, 8% were wearing orthodontic appliances.

Richmond et. al. (1993)\(^13\) reported that 9% of the patients who received orthodontic treatment did not have treatment need based on IOTN criteria.
Similarly Dental Services NHSBSA data analysis have shown that 14% of the patients who received orthodontic treatment under old fee per item service will not qualify for orthodontic treatment under the new contract. Factoring in this finding, **objective orthodontic ‘treatment need’ can be estimated between 36% and 42% of twelve year old population.**

*Unlike dental decay, there is no significant difference in prevalence of malocclusion in children residing in the most deprived and less deprived areas.*

**6. Quantification of Treatment Need: South-East Wales**

Various Primary Care Trusts (PCTs) in England and the LHBs in Wales use either Stephen’s formula or modified Stephen’s formula or 35% of the twelve year-old population to quantify orthodontic treatment need in their area. Some also factor in the percentage of children who access dental services and have dental decay. The National Child Dental Health Survey estimated that 58% of parents of children with clinical need felt that their children did not need orthodontic treatment. However, if this finding is factored in, it would severely underestimate the orthodontic treatment need in a population.

Interceptive orthodontic treatment is provided whilst many baby teeth are still present in the mouth i.e. at the age of 7-9 years of age. A common example of evidence based interceptive orthodontic treatment is in those children where there is posterior cross-bite with jaw displacement on mouth-closure\(^{14}\). This has been recognised in the new orthodontic contract by provision of 3 Unit of Orthodontic Activity (UOAs) for treatment of this age group. Allocation of UOAs for orthodontic assessment and treatment is summarised in Appendix 2.

Due to lack of high level of evidence, the majority of the orthodontists in the UK do not favour early/interceptive treatment for increased overjet, deep overbite or severe crowding\(^{15,16,17}\). This is reflected on the number of claims submitted for interceptive orthodontics in South-East Wales (average of 109/year).
Orthodontic treatment need in the child population of South-East Wales has been quantified in Table 1.

### Table 1 Quantification of orthodontic treatment need in the South-East Wales.

<table>
<thead>
<tr>
<th>12 year-old population (mid 2007) = 16439</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment need</td>
<td>36% of the 12 year-olds</td>
<td>42% of 12 year-olds</td>
</tr>
<tr>
<td></td>
<td>5918</td>
<td>6904</td>
</tr>
<tr>
<td>12 year-old population without active untreated dentinal decay = 11639</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment need</td>
<td>4190</td>
<td>4888</td>
</tr>
<tr>
<td>Average of minimum and maximum</td>
<td>5547</td>
<td></td>
</tr>
</tbody>
</table>

Access to dental services by children, their suitability for treatment on the basis of oral hygiene or multiple enamel decay and patients’ refusal of treatment despite clinical need are not factored in the above calculations.

**Hence, it seems reasonable to estimate that the service provision should be geared to meet the minimum of 4190 ‘treatment starts’/year and if necessary provide the average (5547) to address the current need of the population in South-East Wales. These estimations should not be set in stone but be reviewed as more evidence becomes available and new population figure becomes available.**

### 7 Current Orthodontic Service Provision

#### 7.1. Location of orthodontic providers

The GDS/PDS orthodontic services were provided from twenty-nine practice locations throughout South-East Wales in 2007/08.

Orthodontic services are also provided by the hospitals and community dental services in the region. Consultant led orthodontic services are provided at Cardiff University Dental Hospital, Royal Glamorgan Hospital, Prince Charles Hospital, Royal Gwent Hospital and Nevill Hall Hospital. The CDS provides orthodontic services at
Pontypridd Health Centre, Barry Hospital, Hollies Health Centre and Aberdare Health Centre.

Figure 1 shows the location of orthodontic providers in the South-East Wales. Only those providers who provided more than 1000 UOAs in a year are included in the map.

Figure 1: Location of orthodontic service providers in the South-East Wales (2008).

7.2 GDS/PDS Orthodontics

7.2.1 Claims for Orthodontic Treatment

There were 4740 and 4448 FP17 (orthodontic) claims with ‘treatment starts’ in 2006/07 and 2007/08 respectively. Hence, on average, GDS/PDS orthodontic services in South-East Wales have catered for the treatment of 4594 patients.
Table 2 summarises the GDS/PDS orthodontic activity in the region in 2006/07 and 2007/08.

Table 2: GDS/PDS orthodontic activity in South-East Wales, 2006/07 and 2007/08.

<table>
<thead>
<tr>
<th>Years</th>
<th>Assess and Review</th>
<th>Assess and Refuse</th>
<th>Treatment Starts</th>
<th>Treatment abandoned or discontinued</th>
<th>Treatment Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>7758</td>
<td>1377</td>
<td>4740</td>
<td>206</td>
<td>3062</td>
</tr>
<tr>
<td>2007/08</td>
<td>8966</td>
<td>1426</td>
<td>4448</td>
<td>157</td>
<td>2533</td>
</tr>
</tbody>
</table>

Because of the time required to finish a course of orthodontic treatment, ‘treatment starts’ does not equate to the sum of ‘treatment completed’ and ‘treatment abandoned/discontinued’. However, over the longer period, number of ‘treatment starts’ should not be very different from the sum of ‘treatment completed’ and ‘treatment abandoned/discontinued’.

7.2.2. Current Service Use by each LHB population

Out of 9188 ‘treatment starts’ from March 2006 to March 2008, only 9024 ‘treatment starts’ could be linked to patient postcodes which could be geo-coded. Table 3 shows that the majority of the patients who had orthodontic treatment were from South-East Wales with a few from other Welsh LHBs and England.

Table 3: Number of patients from each new LHB who had orthodontic ‘treatment start’ (2006-2008) compared to population treatment need.
Above analysis (Table 3) also shows that current GDS/PDS service provision meets higher proportion of ‘treatment need’ of Cardiff and Vale LHB population compared to the other two LHBs in the region. This could be due to various reasons such as the difference in level of dental decay in the population and thus suitability for orthodontic treatment, proximity of the services and provision of the CDS/hospital orthodontic services in the area.

7.2.3. Number of Units of Orthodontic Activity (UOAs) commissioned

96,837 UOAs were commissioned by the LHBs in South-East Wales in 2007/08. An additional 3432 UOAs were provided by some GDPs who had an understanding with the LHB to convert their UDAs into UOAs. Hence, the provision of GDS/PDS orthodontic services in the region equated to 100,269 UOAs in 2007/08.

As explained before, the current distribution of orthodontic services is largely based on the historical provision that existed prior to introduction of the new contractual
arrangements. The majority of the orthodontic service is provided via three practices in Cardiff. 61984 UOAs were commissioned through these three practices in 2007/2008. Table 4 shows the number of UOAs provided by contractors in each LHB in South East Wales.

Table 4 Units of Orthodontic Activity (UOAs) provided in the LHBs in South-East Wales, 2007/08.

<table>
<thead>
<tr>
<th>LHBs</th>
<th>UOAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiff and Vale LHB</td>
<td>67,342</td>
</tr>
<tr>
<td>Cwm Taf LHB</td>
<td>4936</td>
</tr>
<tr>
<td>Aneurin Bevan LHB</td>
<td>27991</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100,269</strong></td>
</tr>
</tbody>
</table>

7.2.4 GDS/PDS orthodontic expenditure

In 2007/08, 100,269 UOAs were commissioned by the LHBs in the region. If average cost of one UOA is £55, the orthodontic expenditure in the region amounts to £5,514,795. In the same period, 457,537 UDAs were claimed for the mandatory GDS/PDS services for the children. At an average cost of £22/UDA, expenditure on mandatory GDS/PDS services for the children in the region amounts to £10,065, 814. This shows that orthodontic expenditure constitutes around 35% of the money spent in children’s dentistry in the primary care.

7.2.5 Performance of orthodontic providers

According to the LHBs in the region, underperformance of orthodontic providers was not an issue.
7.2.6 Age profile of orthodontic patients

Assuming the date of birth entered on FP17 (orthodontics) by the providers/performers was correct, the mean age of patients who had treatment starts in 2007/08 was 13.04 years (95% CI 12.97, 13.09). Mean age of those patients who had assessment only (assess and review or assess and refuse) was 11.61 yrs (95% CI 11.55, 11.66). This shows that those patients who had orthodontic assessment only were significantly younger than those who were accepted for treatment. **54.7%** of those who had assessment and review were of age 11 years or younger.

There are some valid reasons for referral of children in primary or mixed dentition for an orthodontic assessment or treatment. Nevertheless, it seems that many children are referred for orthodontic treatment/consultations prematurely. This has implications on the waiting time/lists.

7.2.7 Which IOTN grades are being seen in GDS/PDS orthodontic service?

Under the new dental contract, orthodontic treatment in the NHS GDS/PDS services is available to children (≤18 years) with IOTN scoring 5, 4 and 3 with AC>6. Furthermore, a small proportion of children, aged 7-9 years are also provided with early/interceptive orthodontic treatment.

There were 14, 840 FP17s with claims for either assess & review or assess & refuse or ‘treatment starts’ in 2007/08. However, 53% of these FP17s did not include IOTN scoring. Furthermore, when IOTN scoring was included, 52% of them were of IOTN 1, 2 and 3 with AC< 6. It should be noted that almost all of these were for assessments only and did not start treatment.

7.2.8 Orthodontic treatment outcome
The Child Dental Health Survey, 2003, found that 12% of 15 year-old children still required orthodontic treatment based on DHC of IOTN despite having received a course of treatment in the past.

Peer Assessment Rating (PAR index) was developed by the orthodontic profession to objectively assess orthodontic treatment outcomes. Orthodontic treatment providers under the new contract regulations are required to assess the outcome of orthodontic treatment using PAR Index before and after the treatment.

If an orthodontic provider/performer treats 20 cases or less, all of these cases should be PAR scored. Those performers/providers, who treat more than 20 cases, should PAR score 20 cases plus 10% of the remaining cases.

It was not clear from the communication with the LHBs if outcome of orthodontic treatment carried out in the region was monitored using PAR index.

7.2.9 Travel time and distance for patients

Travel time and distance was calculated using the patient postcodes on FP17s for the year 2007/08 and the practice postcodes where the patients were treated. On average, patients travelled 8.2 Km (5.1 miles, one way) for orthodontic assessment or treatment. This distance, on average, takes 12 minutes by private transport/car.

Many patients from Cwm Taf LHB and Aneurin Bevan LHB travel to Cardiff for their orthodontic assessment and treatment as the majority of the orthodontic services in South-East Wales is provided from three practices in Cardiff. Travelling time and distance for these patients is much longer (Table 5).

Table 5: Average travelling time and distance for patients attending three large orthodontic practices in Cardiff (2007/08).
### 7.2.10 Patient Flow in terms of Units of Orthodontic Activity

In 2007/08, orthodontic providers in the new Cardiff and Vale LHB claimed around thirteen thousand UOAs for the orthodontic care of residents of Cwm Taf LHB and ten thousand UOAs for the residents of Aneurin Bevan LHB. Similarly, 1385 UOAs claimed by the providers in the Aneurin Bevan LHB were for the assessment or treatment carried out in patients from English PCTs. (Table 6).

**Table 6: Patient flow, in terms of Units of Orthodontic Activity, between the LHBs in South-East Wales.**

<table>
<thead>
<tr>
<th>Provider LHB ▼</th>
<th>Patient LHBs and UOAs claimed ▼.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cardiff and Vale</td>
</tr>
<tr>
<td><strong>Cardiff and Vale LHB</strong></td>
<td>38461</td>
</tr>
<tr>
<td><strong>Cwm Taf LHB</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>Aneurin Bevan LHB</strong></td>
<td>121</td>
</tr>
</tbody>
</table>
7.2.11 Current Waiting time in GDS/PDS

Twenty six proformas were sent to orthodontic providers mainly requesting information on referrals and waiting times. Fourteen were completed and returned. It seems that the number of referrals received by these practices in the year 2006/07 and 2007/08 were very similar. Many GDS providers have small orthodontic contracts and treat their own practice patients only.

Some orthodontic providers reported that they have a standard referral proforma to be used by the referring dentists. However, they also commented that many referring dentists do not use the proforma and IOTN is not included in many referral letters.

Reported average waiting time from referral to assessment is 47 weeks (ranges 2 to 104 weeks). Because of the wide range of reported waiting times, caution needs to be exercised when interpreting this figure. Current average waiting time from referral to assessment in three large orthodontic providers in Cardiff is 67 weeks (48 to 88 weeks).

Average waiting time from assessment to treatment (based on 11 providers who provided the data) was 32 weeks. However, eligible patients receive treatment within 2 weeks of initial assessment in three large orthodontic providers in Cardiff.

Some orthodontic providers have commented that they have surplus capacity to carry out more orthodontic work if further funding was available.

7.2.12 Current service use by deprivation

There is no difference in prevalence of malocclusion between children residing in different deprivation quintiles. Hence, it can be hypothesised that there should be no difference in the proportion of children receiving orthodontic treatment from each deprivation quintile.
It is a common practice to compare the use of services between the most deprived and the least deprived quintile. Such comparisons will show the equity of the service use. The statistical analysis of the data showed that the children residing in the least deprived quintile were significantly more likely to use orthodontic services compared to the children living in the most deprived areas (difference between the two quintiles= 7%). This may be partly due to higher demand for orthodontic services from the least deprived population and partly due to higher decay rates in the most deprived population making them unsuitable for orthodontic treatment. Further work is required to find out if the inequity in service use exists in terms of deprivation and geography despite adjustment for decay rate.

7.3 Hospital/Community Orthodontic Service

Unlike the GDS/PDS orthodontic service providers, orthodontic units at different hospitals in South-East Wales (Fig 1, Red Plus) not only provide orthodontic treatment to children but also to adults. Hospitals give priority to those children and adults who require complex and multidisciplinary treatment. These consultant led services are also involved in teaching and research.

A proforma was sent to all the hospitals and CDS orthodontic units requesting the data. Orthodontic service capacity of the hospitals and CDS in South-East Wales seems to be stable over the last few years with slight fluctuation. The fluctuation was mainly due to change over of consultants and varying number of specialist trainees.

The type of data collected in hospital and CDS orthodontic units is not comparable to GDS/PDS data. The number of ‘treatment starts’ or ‘treatment completed’ was estimated based on the laboratory data/ patients dental casts or the recording of PAR scoring. Data provided in terms of ‘completed treatments’ underestimates the actual number of patients who received orthodontic treatment. This is because some units did not include the patients treated by functional and removal appliances. Both the number of ‘treatment starts’ and ‘treatment completed’ was provided by one of the units. The ratio of ‘treatment start’: ‘treatment completed’ was 1.8. This factor was
used to estimate the ‘treatment starts’ for other units. Orthodontic services at hospitals also treat adult patients. It was reported that around 5-20% of the patients who receive orthodontic treatment in HDS were adults. Considering this factor, it was estimated that around 817 children/year receive orthodontic treatment from the HDS and CDS.

Summary of the CDS and hospital orthodontic services (excluding University Dental Hospital) in South-East Wales is presented in Table 7.

Table 7: Snapshot of the hospital and CDS orthodontic service (excluding dental hospital).

<table>
<thead>
<tr>
<th>No. of Referrals</th>
<th>Current W/T from Referral to Assessment</th>
<th>Workforce WTE</th>
<th>Est. Tx starts/yr (total)</th>
<th>Est. Tx start/yr for children only</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005/06</td>
<td>2483</td>
<td>2280</td>
<td>3.6</td>
<td>969</td>
</tr>
<tr>
<td>2308</td>
<td>Hosp: 6-10 weeks</td>
<td>Cons</td>
<td>SpRs</td>
<td>Specialists</td>
</tr>
<tr>
<td></td>
<td>CDS: 16-19 weeks</td>
<td>3.2</td>
<td>1.9</td>
<td>0.45</td>
</tr>
</tbody>
</table>

The orthodontic unit at the University Dental Hospital received 1342, 1394 and 1470 referrals in the year 2005/06, 2006/07 and 2007/08 respectively. The unit changed referral acceptance criteria in early 2009. Referrals for the treatment of children with IOTN 4 and 5 are accepted. Some children with IOTN 3 are accepted for treatment if they are suitable for teaching. Those adults, who require multi-disciplinary management, including orthodontic treatment, are also accepted.

The current waiting time from referral to assessment at the University Dental Hospital is about 10 weeks. Orthodontic services are provided by 2.2 consultants, 0.7 senior specialist trainees (Fixed time training appointments), 0.3 specialists, 1.2 specialist trainees. Seven overseas postgraduate students also provide orthodontic treatment.

The number of patients who had orthodontic ‘treatment starts’ or ‘treatment completed’ in the University Dental Hospital each year was not available. Orthodontic
workforce survey\textsuperscript{18} carried out in 2005 estimated the number of cases treated per year by one whole time equivalent (5 days clinical week) of different professional groups within orthodontic workforce (Table 8).

**Table 8: Estimated average number of cases treated per year by various orthodontic professional groups. (British Orthodontic Workforce Survey, 2005).**

<table>
<thead>
<tr>
<th>Professional Groups</th>
<th>Consultants</th>
<th>Specialist Trainees (SpRs/FTTAs)</th>
<th>Specialist practitioners</th>
<th>CDS</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases treated/year</td>
<td>142</td>
<td>146</td>
<td>400</td>
<td>193</td>
<td>187</td>
</tr>
</tbody>
</table>

Our data, though conservative estimate, (Table 8) suggests that the British Orthodontic Workforce Survey, 2005, most probably overestimated the number of cases treated per year by various salaried orthodontic groups. Hence, the number of cases treated per year based on WTE workforce in the University Dental Hospital was not estimated.

**8. Conclusion**

Current GDS/PDS and CDS/HDS provision of orthodontic services in South-East Wales seems adequate to address the treatment need of the child population (Table 9).

**Table 9: Comparison of orthodontic treatment need and provision, South-East Wales.**

<table>
<thead>
<tr>
<th>Estimated Treatment Need (See section 5)</th>
<th>The GDS/PDS provision</th>
<th>Estimated Hospital/CDS provision</th>
<th>Total orthodontic provision</th>
</tr>
</thead>
</table>

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The access to the orthodontic services is largely demand led rather than based on needs. This has created a long waiting time for patients to see a GDS/PDS orthodontic provider/performer.

The following listed reasons could be contributing to the long waiting time in primary care.

- High number of referrals/assessment of patients with IOTN 1, 2 and 3 with AC<6.
- Multiple referrals of the same patient to different orthodontic providers.
- High number of premature referrals resulting in high number of assessment and reviews.
- Inaccurate record and reporting of waiting lists.

9. Recommendations

Recommendations to the LHBs

- The main priority of the LHBs must be improvement of the dental health of their population. This involves ensuring that access to the GDS services is sufficient as well as equitable and effective preventive services are in place. Hence, further expansion of the orthodontic services in the resource limited system can not be justified.

- Currently the majority of the orthodontic services for the South-East Wales population are provided via three practices in Cardiff. The providers in these practices hold PDS contracts with Cardiff LHB. Many patients from
neighbouring LHBs travel to Cardiff for orthodontic assessment or treatment. If re-orientation of the services are planned in the future to provide services locally, the LHBs need to consider the regulatory constraints, orthodontic providers’ perspective, patient’s views, financial implications and continuity of care of those patients who are currently undergoing treatment. Furthermore, any re-allocation of the resources should be based on the ‘treatment need’ of the LHB population rather than the historical treatment pattern.

- The LHBs should stop the practice of converting UDAs into UOAs as soon as possible.

- Access to orthodontic services should be based on need rather than demand. Orthodontic referral criteria and a referral proforma based on these criteria should be developed. Referral criteria and proforma should be widely publicised among the referring dentists. Those referrals which do not fulfil the minimum criteria can be returned back to the practitioners for completion of the information. Periodic audits will be required to check if the majority of the referrals meet the criteria. This may reduce the number of inappropriate and premature referrals.

- There seems to be a need to educate general dental practitioners in use of IOTN so that they can correctly identify and refer only those children who will benefit from orthodontic treatment. They should be made aware of referral criteria and the reasons for using referral proforma. The LHBs should collaborate with postgraduate dental deanery for the provision of such courses.

- Quality in terms of outcome of orthodontic treatment carried out in the region is unknown. Additional to the delivery of UOAs, the LHBs should also monitor treatment outcomes by PAR index, completeness of FP17s for clinical data including IOTN, assessment: treatment start ratio, number of completed,
incomplete and abandoned treatments, number of repairs and number of assess and reviews.

**Recommendations to the National Public Health Service**

- The Dental Public Health Team at the NPHS, LHBs and the MCN in Orthodontics should work together to reduce the waiting time for patients. This could include a centralised referral system. However, advantages and disadvantages of such system should be considered.

- Further work is required to find out if the inequity in service use exists in terms of deprivation and geography despite adjustment for decay rate.

**Recommendations to the Welsh Assembly Government**

- The Task and Finish Group set up by the Minister for Health and Social Care should review the availability, efficiency and effectiveness of specialist dental services, including orthodontics, in Wales. Such work should be followed by guidance to the new LHBs on how to prioritise specialist services in the context of mandatory dental services and oral health prevention/promotion.

10. References:


The Index of Orthodontic Treatment Need (IOTN)

The index of Orthodontic Treatment Need (IOTN) compromises two components: Dental Health Component and Aesthetic Component.

**Dental Health Component (DHC)**

Dental Health Component (DHC) categorises the various deviation from normal occlusion in terms of severity. There are five grades. IOTN 5 represents a severe malocclusion while IOTN 1 represents only a small deviation from normal. The level of orthodontic need can be categorised as:

- IOTN 5: Very Great Need
- IOTN 4: Great Need
- IOTN 3: Moderate Need
- IOTN 2: Little
- IOTN 1: No Need

Table A outlines different IOTN grades and associated clinical features.

**Table A**

<table>
<thead>
<tr>
<th>IOTN Grade</th>
<th>Dental Health Component of IOTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOTN 5</td>
<td>Increased overjet &gt; 9mm</td>
</tr>
<tr>
<td>IOTN 4</td>
<td></td>
</tr>
<tr>
<td>IOTN 3</td>
<td></td>
</tr>
<tr>
<td>IOTN 2</td>
<td></td>
</tr>
<tr>
<td>IOTN 1</td>
<td></td>
</tr>
</tbody>
</table>
missing in any quadrant) requiring pre-restorative orthodontics
i. Impeded eruption of teeth (with exception of third molars) due to
crowding, displacement, supernumerary tooth, retained deciduous teeth and
any pathological cause
m. Reverse overjet greater than 3.5mm with reported masticatory and
speech difficulties
p. Defects of cleft lip and palate
s. Submerged deciduous teeth

IOTN Grade 4
a. Increased overjet > 6mm but ≤ 9mm
b. Reverse overjet > 3.5mm with no masticatory or speech difficulties
c. Anterior or posterior cross-bite with > 2mm discrepancy between
retruded contact position and intercuspal position
d. Severe displacements of teeth > 4mm
c. Extreme lateral or anterior open bites ≥4mm
f. Increased and complete overbite with labial and palatal trauma
h. Less extensive hypodontia (one tooth missing per quadrant)
requiring pre-restorative orthodontics or orthodontic space closure to
obviate the need for a prosthesis.
l. Posterior lingual cross-bite with no functional occlusal contact in
one or both buccal segments.
m. Reverse overjet greater than 1mm but with ≤ 3.5mm with recorded
masticatory and speech difficulties.
t. Partially erupted teeth, tipped and impacted against adjacent teeth.
x. Supplemental teeth

IOTN Grade 3
a. Increased overjet > 3.5mm but ≤ 6mm with incompetent lips
b. Reverse overjet greater than 1mm but ≤ 3.5mm.
c. Anterior or posterior cross-bite with >1mm but ≤ 2mm discrepancy
between retruded contact position and intercuspal position.
d. Displacement of teeth > 2mm but to ≤ 4mm
e. Lateral or anterior open bite greater than 2mm but ≤ 4mm
f. Increased and complete overbite without labial or palatal trauma

IOTN Grade 2
a. Increased overjet > 3.5mm but ≤ 6mm with competent lips.
b. Reverse overjet >0 mm but ≤ 1mm  
c. Anterior or posterior cross-bite with ≤ 1mm discrepancy between retracted contact position and intercuspal position  
d. Displacement of teeth >1mm but ≤ 2mm  
e. Anterior or posterior open bite >1mm but ≤ 2mm  
f. Increased overbite ≥3.5mm without gingival contact  
g. Prenormal or postnormal occlusions with no other anomalies. Includes up to half a unit discrepancy.

IOTN Grade 1 Extremely minor malocclusions including displacements < 1mm.


**Aesthetic Component (AC)**

The Aesthetic Component of IOTN consists of grading based on attractiveness of arrangement of teeth. Ten photographs with varying degree of attractiveness are categorised on a scale of 1 to 10; one being the most attractive and 10 the least attractive. An individual’s dental arrangement is compared to that of the photographs. The photograph with the closest similarity is chosen with its score for the individual.

**The Peer Assessment Rating (PAR Index)**

PAR Index was developed by the orthodontic profession in order to assess orthodontic treatment outcome. Scores are given to various occlusal traits that are summed up to produce an overall score. A score of zero would indicate good alignment of teeth and higher scores indicating increased level of irregularity. The difference between the pre and post orthodontic treatment represent the degree of improvement.

There are five components of the PAR Index (Table B). (Please refer Richmond S, Evaluating Effective Orthodontic Care, 1st Edition, First Numerics Ltd. for detail)

**Table B: Five Components of the PAR Index**

| 1 | Upper and Lower anterior | Crowding, spacing and impacted teeth are scored |

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<table>
<thead>
<tr>
<th>segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Left and right buccal occlusion</td>
</tr>
<tr>
<td>3</td>
<td>Overjet</td>
</tr>
<tr>
<td>4</td>
<td>Overbite/openbite</td>
</tr>
<tr>
<td>5</td>
<td>Centreline</td>
</tr>
</tbody>
</table>

Outcome of orthodontic treatment is calculated as follows.

- Reduction in PAR score is calculated by subtracting post-treatment score from pre-treatment score, for example 40 to 5, a reduction of 35 PAR points.
- Percentage of reduction is calculated, for above example, \(35 \div 40 \times 100 = 87.5\%\). A percentage improvement of greater than 70% can be considered as a good standard of orthodontic treatment.
- There are three categories of improvement: ‘Worse/No different’, ‘Improved’ and ‘Greatly improved’. In general, for a case to be improved, the malocclusion needs to be improved/ reduced by at least 30 percent. For a case to be greatly improved, the case has to be reduced by at least 22 PAR points.
- A high standard treatment is achieved when the proportion of cases falling into the ‘Worse/No different’ category of an orthodontist’s case load is less than 5 percent with the mean reduction of PAR score being greater than 70 percent.
Appendix 2

Allocation of Units of Orthodontic Activity (UOAs)

Each course of orthodontic treatment is weighted according to the age of the patient at the date the treatment started. UOAs are allocated to a contract at the start of a course of orthodontic treatment. Orthodontic assessments that do not result in treatment are allocated one unit of orthodontic activity.

<table>
<thead>
<tr>
<th>Assessment only</th>
<th>Assessment &amp; review</th>
<th>1 UOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment &amp; refuse treatment</td>
<td>1 UOA</td>
<td></td>
</tr>
<tr>
<td>Active treatment started</td>
<td>Assessment and start treatment:</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Patient:</th>
<th>UOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient under 10 years</td>
<td>4</td>
</tr>
<tr>
<td>Patient aged 10-17 years</td>
<td>21</td>
</tr>
<tr>
<td>Patient aged 18 or over</td>
<td>23</td>
</tr>
<tr>
<td>Repairs: Repairs to an appliance fitted by another dentist</td>
<td>0.8</td>
</tr>
<tr>
<td>Replacement appliances: Replacement appliances (regulation 11) – instead the dentist can retain 30% of the band 3 patient charge</td>
<td>0</td>
</tr>
</tbody>
</table>