

## Closing the Gap for children with prominent front teeth

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# CLOSING THE GAP

FOR CHILDREN WITH PROMINENT FRONT TEETH

DR CIARA SCOTT  
09107681

# Closing the Gap for children with prominent front teeth

Development and implementation of an evidence based clinical protocol to improve quality in delivery of care to children with prominent front teeth in one HSE Regional Orthodontic Unit.

A Dissertation submitted in part fulfilment of the degree of MSc Leadership and Management Development, Institute of Leadership, Royal College of Surgeons in Ireland

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Contents:	page
Acknowledgements	v
Abstract	vi
List of Tables	vii
List of Figures	viii
 Chapter 1: Introduction	 2
1.1 Introduction	
1.2 Organisational Context	3
1.3 Rationale	6
1.4 Aims and Objectives	7
1.4.1 Aims	7
1.4.2 Objectives	8
1.5 Role of the Student	8
1.6 Summary and Conclusion	9
 Chapter 2: Literature Review	 10
2.1 Introduction	10
2.2 Data Search	
2.3 Review of Themes	10
2.3.1 Management of IOTN 5a cases	11
2.3.1.1 Introduction	11
2.3.1.2 Effects of treatment	11
2.3.1.3 Treatment changes	12
2.3.1.4 Timing of treatment	13
2.3.1.5 Risk of Trauma	14
2.3.1.6 Profile Changes	14
2.3.1.8 Patient Factors	15
2.3.2.8 Compliance	15
2.3.2 Quality improvement and performance indicators	16
2.3.3 Cost effectiveness in Orthodontics	17
2.4 Implications for the project	20
2.5 Summary	22

Chapter 3: Organisational Development Process	page
3.1 Introduction	24
3.2 Critical Review of approaches to Organisational Development	24
3.3 Rational for OD Model selected	27
3.4 HSE Change Model	27
3.4.1 Initiation	28
3.4.1.1 Evaluation of service	28
3.4.1.2 Understanding the need and scope for change	29
3.4.1.3 Understanding the patient journey	34
3.4.1.4 Outcome of the patient journey analysis	34
3. 4.1.5 Understanding the waiting list	38
3.4.2 Planning	39
3.4.2.1 Introduction	39
3.4.2.2 Preparing the protocol	39
3.4.2.3 Determining the detail for the change	41
3.4.2.4 Designing the detail of the future stage	41
3.4.2.5 Preparing for implementation	42
3.4.3 Implementation	42
3.4.4 Mainstreaming	45
3.5 Conclusion	46
Chapter 4: Evaluation	47
4.1 Introduction	47
4.2 Significance of Healthcare evaluation	47
4.3 Evaluation	47
4.3.1 Aims	47
4.3.2 Methods and Measures	47
4.3.3 Results	49
4.3.3.1 Evaluation of Access Measures	49
4.3.3.2 Evaluation of Quality Measures	50
4.3.3.3 Evaluation of HR Measures	54
4.3.3.4 Evaluation of Finance Measures	56
4.3.4 Dissemination Plan	58
4.4Summary and Conclusion	58

Chapter 5: Discussion	page
5.1 Introduction	59
5.2 Strengths	59
5.3 Limitations	63
5.4 Recommendations	63
5.5 Summary	64
List of References	68
Appendices	77
Appendix 1 IOTN (Brook&Shaw 1989)	77
Appendix 2 Aesthetic Component of IOTN (Evans&Shaw 1987)	78
Appendix 3 HSE Modified IOTN Guidelines for Eligibility	79
Appendix 4 HSE Quality Improvement Division Mission	80
Appendix 5 Donabedian (1988) model for Quality Improvement	81
Appendix 6 Stakeholder Analysis	82
Appendix 7 SWOT Analysis	83
Appendix 8 Proposed Protocol January 2016	84
Appendix 9 IOTN5a Clinical Protocol April 2014	85
Appendix 10 Glossary of Abbreviations and Orthodontic terms.	88
Appendix 11 Poster Presentation	90

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Clinical orthodontics for children with the most severe malocclusions is very rewarding and the experience of leading this change process within the service has been both challenging and fulfilling. I believe that we have a great team and a great service and that process improvements can continue to improve the service experience for both patients and clinicians.

I'd like to dedicate this thesis to my uncle Ray, a self-proclaimed simple man who lead an extraordinary 'simple' life as a missionary in Kenya. I found this quote framed in his home and it sums up the kind of leader he was.

"A leader is best when he is neither seen nor heard  
Not so good when he is adored and glorified  
Worse when he is hated and despised  
But of a good leader  
When his work is done, his aim fulfilled  
The people will say  
We did this Ourselves"  
(Lao Tzu)



## Abstract

This OD project was introduced in one large HSE Regional Orthodontic Unit. It was a process change project to improve the quality of delivery of care for children very prominent front teeth, with Index of Orthodontic Treatment Need (IOTN5a)

Many growing IOTN5a patients have a 'window of opportunity' when treatment with a functional appliance (twin-block) will be most efficient and most effective. Orthodontic treatment for non-growing IOTN5a patients is often less ideal for the patient, the clinician and may involve surgery which is more expensive for the service.

Allocating patients to treatment from the sequential waiting list for IOTN5a is unbalanced due to the wide variation in patient age and clinical urgency on the IOTN5a waiting list. Quality management can reduce variation in systems and improve processes.

The aims and objectives of this OD project were to develop a standardised clinical protocol using NCEC Guidance for clinicians to apply at assessment of IOTN5a patients. This was based on the best clinical evidence for the timing of treatment and the evidence for cost-minimisation and cost-effectiveness of treatment.

Using the HSE Change Model, the new process was implemented, using the protocol to record an indicative date for treatment to start. A key performance indicator was developed to measure compliance with protocol and to measure the new quality standard.

A balanced score card evaluation outlines the benefits of the change from the different stakeholders' perspective. The process change was successful in improving IOTN5a patient's access to functional appliance treatment. Further mainstreaming and evaluation of outcome measures and is required.

This quality improvement is patient-centred but benefits all the stakeholders. There is a cost-benefit to the service by providing treatment at the most efficient and effect time.

## List of Tables:

	page
Table 1: Patient Journey Analysis Data	34
Table 2: Waiting List pre implementation	37
Table 3: The 7 criteria for Clinical Protocol Development	39

## List of Figures

	page
Figure 1: Evidence Based Practice	22
Figure 2: Senior and Swailes Model of Change 2002	26
Figure 3: HSE Change Model	27
Figure 4: Lewin's force field analysis of drivers	30
Figure 5: The patient journey chart	32
Figure 6: Comparison of time waiting for active treatment by assessment age	35
Figure 7: IOTN5a Waiting List October 2015 by age	37
Figure 8: IOTN5a waiting list by age and assessment date January 2016	42
Figure 9: The 3 sources of IOTN5a patients	43
Figure 10: New Process with KPI's	45
Figure 11: Balanced Score Card for Evaluation	47
Figure 12: Comparision of IOTN5a waiting list by age after intervention	48
Figure 13: Comparision of IOTN5a waiting list with expected patient numbers without intervention.	48
Figure 14: Patient flow process after intervention	50
Figure 15: Compliance with the protocol	51
Figure 16: Capacity Analysis	53
Figure 17: Demand and capacity	56
Figure 18: Patient journey for the new process	65
Figure 19: Timing of treatment	

## Chapter 1 Introduction

### 1.1 Introduction

Quality management has been described as “a comprehensive strategy of organisational and attitude change, enabling staff to learn and use quality methods, in order to reduce costs and meet the requirements of patients.” (Øvretveit, 2000)

Good governance is fundamentally linked to accountability, safety and quality of our services to improve health outcomes. The HSE mission statement endorses best use of resources to benefit our patients. The National Quality Framework for Children and Young People 2014-2020 (Better Outcomes, Brighter Futures, DCYA,2014) outlined the Government’s commitment to 6 transformational goals to improve the effectiveness of policies, services and outcomes for children and young people in 5 key areas, including health. These goals included ensuring quality services, earlier intervention, prevention and supporting parents. The document states that the government recognises that quality services “must be outcomes focused and informed by evidence, have effective quality assurance systems in place, strong leadership, appropriate organisational structures, culture and a clear strategic direction.” It also notes that, “prevention and early intervention is cost-effective and a commitment to future planning and cost benefit analysis is required.”(DCYA,2014,p32)

Organisational Development (OD) programmes can be designed to meet the objectives and values of an organisation. This OD project will evaluate the patient pathway for children with prominent front teeth in one regional orthodontic unit and develop a clinically evidence based protocol to improve that process, to improve quality and deliver care in a cost-effective way.

## 1.2 Organisational Context:

The Department of Health and Children introduced guidelines for the provision of orthodontic treatment within the HSE in 1985 and these were revised following an Orthodontic Review. (Orthodontic Review Group Report, HSE,2006)

The Index of Orthodontic Treatment Need (IOTN) was developed in Manchester (Brook&Shaw, 1989) and was a variation of an index used by the dental board in Sweden. It identifies specific occlusal traits, deemed to be of dental health significance and indicate orthodontic need. Malocclusions are categorised using a scale of 1-5, 5 being a very great need for orthodontic treatment and 1 and 2 being little or no need. Each category is divided into subgroups specifying the occlusal trait. (Appendix 1) There is also an aesthetic component to treatment need, using a scale of 1-10 of orthodontic appearance. (Evans &Shaw,1987) (Appendix 2). It is used in the NHS and widely accepted as a useful tool for planning orthodontic provision. (Oliveira, 2003).

The HSE Modified IOTN Guidelines, introduced in 2007, (Appendix 3) combine elements of the IOTN and the aesthetic component to identify and prioritise children with the highest orthodontic need for treatment. Eligible patients have IOTN Grade 5(great need) or Grade 4(need) with a high aesthetic component. (8-10) Patients with IOTN 1-3 and some IOTN 4 cases are not eligible for HSE Orthodontic treatment.

Referral to the Orthodontic Service is made by the Principal Dental Surgeon in each area, following a primary care dental assessment in 2<sup>nd</sup> Class, 4<sup>th</sup> Class or 6<sup>th</sup> Class or later so there is a large range of patient age, orthodontic need and urgency of the referred group.

The 2015 National Service Plan (HSE, 2015 p31) for Primary Care states key performance indicators(KPI's) for the orthodontic service as:

75% of referrals seen for assessment within 6months

<5% of patients on the treatment waiting list for more than 4years

Best practice in waiting list management outlines that routine patients should be taken off the waiting list sequentially. (Performance Improvement in Scheduled Care, NTPF,2013 p16)

Many orthodontic problems can be treated at any age and dental stage, but the timing of treatment for some orthodontic problems is critical. This can include, but does not exclusively relate to: prominent front teeth (IOTN5a) Impacted incisors or impacted canines with resorption (IOTN5i) and anterior crossbites with tooth wear (IOTN4c). There are no formal urgent or routine waiting lists either for assessment or treatment, but IOTN5 patients are prioritised above IOTN4. Whilst IOTN5a and 5i cases can be time critical, IOTN5h (multiple missing teeth) and IOTN5m (severe reverse overjet) usually benefit from waiting. This project will focus on a protocol for IOTN5a patients.(Appendix 1,IOTN Appendix 10,Glossary of Terms)

### **What is IOTN5a?**

Patients with IOTN5a have prominent front teeth with an overjet greater than 9mm. The term overjet is used to measure the horizontal projection of the upper front teeth beyond the lower front teeth. Normal overjet is 1-3mm and this is described as a Class I occlusion. Patients with an overjet greater than 9mm have a severe Class II division I malocclusion and will score highly on the dental health component (IOTN5a) and the aesthetic component (8-10) and are eligible for HSE Orthodontic Treatment.

The aetiology of a Class II division I malocclusion can be related to dental, skeletal or soft tissue factors or any combination of the three and can vary in severity.

- Dental factors: proclined incisors (ie. front teeth sticking out)
- Skeletal factors: discrepancy between the upper and lower jaws, often with the lower jaw being deficient.
- Soft tissue factors such as lip posture and lip competence.
- Habits such as thumb sucking can also increase the overjet.

The aetiology and severity of the malocclusion will influence the treatment plan, but the timing of referral and treatment, in addition to other clinician and patient factors will also determine the choice of treatment. For this reason, there may be a “window of opportunity” for IOTN5a patients when the most ideal treatment outcome can be achieved. The evidence for appliance choice and the timing of treatment will be discussed in Chapter2.

Sequential waiting list management does not prioritise patients with the most urgent clinical need. In this unit, the IOTN5 waiting list has increased to over 2 years (July 2015). Clinicians understand that some patients may be compromised by waiting and try to prioritise some cases they think are urgent. However, there are no standardised criteria for this at present, which leads to wide variation in patient access to our service.

Sequential waiting lists for IOTN5a are not efficient or effective for any stakeholders:

1. **Patients:** The length of waiting time cannot be accurately predicted at assessment, patients become urgent whilst waiting, the current ad hoc system for prioritisation does not always identify them. Prioritising some patients and not others is not equitable. Patients who miss the “window of opportunity” may have to accept a compromised outcome or a more complex treatment plan involving surgery.
2. **Clinician:** Clinicians want to treat patients at the right time to ensure a good outcome.
3. **Service:** The perception of wait can encourage referral of younger children as dentists and parents are concerned about waiting times. Sometimes referred patients are too young for assessment or treatment. This incurs additional costs and inappropriate use of finite specialist time. Unless all patients on the waiting list are ready for treatment, the waiting list metrics do not measure unmet clinical need. Later treatment may be more complex and more expensive to provide.

Long waiting times for HSE orthodontic treatment for IOTN5a cases may not allow the most ideal treatment outcome or the most cost-effective treatment and lead to a perception amongst patients that the service is substandard.

In a recent publication of 'Ireland's Dental Magazine' (April,2015), the President of the Orthodontic Society of Ireland, who is a Specialist Orthodontist in the HSE expressed frustration at waiting lists; "If someone is waiting three years for treatment, you have sometimes missed the optimum time for treatment. We are clinicians and want the best for our patients...our hands are tied because we are not getting the patients at the best time." Scholes (2001) outlines how powerful "the story" of the organisation is on the organisational culture and the potential effects on all stakeholders, affecting recruitment, retention, engagement as well as trust and patient outcome and satisfaction. An Irish orthodontic workforce survey in 2006 reported that 24% of HSE orthodontists intended to leave the service, but did not investigate their reasons. (McGuinness,2006). Bottomless waiting lists can lead to low engagement, burnout or resignations. Staff benefit from goals for achievement and opportunity to celebrate success. (Buchanan,2013)

Many parents, patients and referring dentists face confusion regarding the appropriate timing of treatment (Turpin,2004). Many private orthodontist websites will recommend orthodontic visits from age 7 on one page and then state that orthodontics is possible at any age when promoting adult treatments. Parents often ask at assessment is "is it ok to wait?" Clinicians cannot answer that if we do not understand and control our waiting lists and have strategies to manage the timing of treatment.

### **1.3 Rationale**

The 2015 National Service Plan(HSE,2015,p9) recommends that KPI's should be aligned with strategic goals and should measure improvements in structures and processes that lead to



measurable improvements in patient experience, effectiveness quality and safety. KPI's that measure waiting times irrespective of age or clinical urgency do not do this.

A process is a simple method by which the patient journey is managed. Demand and capacity theory suggests that the presence of a queue is not always an indicator of a shortage of capacity. (Allder,2010). Well timed interception can reduce the treatment time, increase efficiency, reduce morbidity and reduce cost and improve patient outcome.

Developing a patient pathway for management of referrals of children with prominent teeth based on best evidence will:

1. Provide transparency for referring dentists, patients, parents.
2. Improve efficiency and reduce unnecessary assessment and review of young children.
3. Provide more equitable access to the service.
4. Allow well timed clinical treatment, improving efficiency and outcome.
5. Allow a key performance measure related to the timing of treatment be developed and introduced.

## **1.4 Aims and Objectives**

### **1.4.1 Aims**

The aim of this project is develop a clinical protocol to manage IOTN5a referrals.

The National Clinical Excellence Committee (NCEC) was established in 2010 by the Minister of Health as part of the Patient Safety First initiative. The terms of reference are to establish criteria for quality assurance in health care delivery by the introduction of Clinical Care Pathways based on best practice and to publish standards for developing clinical guidelines and protocols. I aim to use the NCEC Guidelines (NCEC,2015) to develop and implement a standardised clinical protocol for IOTN5a referrals in one Regional Orthodontic Unit.

### 1.4.2 SMART objectives of the project

By December 2015, evaluate the patient flow in the service to identify the current state. Identify variation in age and variation in waiting time in the current state and discuss with the clinical team.

By January 2016, implement a process improvement with a standardised clinical protocol for management of IOTN5a referrals using HSE Change Model.

By April 2016 evaluate and improve the protocol and develop an audit measure (KPI) within the unit for management of IOTN5a

By May 2016, complete review and thesis and present findings with view to implementation across other units.

### 1.5 Role of the student

As the student, I shall:

1. Coordinate with key stakeholders to discuss the potential outcomes, benefits and threats of the proposed study and use feedback to improve the project.
2. Assess variation in the patient pathway for IOTN5a patients to identify bottlenecks and measure service needs for different treatment modalities.
3. Undertake a literature review for best evidence on management of children with prominent teeth, quality management and key performance indicators and cost-effectiveness strategies in healthcare.
4. Develop and implement a protocol for providing interception with functional appliances to eligible IOTN5a patients who may benefit from them, using the HSE Change Model.
5. Train staff in use of protocol, measure compliance and evaluate.
6. Share findings with National Oral Health Office and National Consultant Orthodontist Group with view to implementation across other units.

## 1.6 Summary and Conclusion

From a clinical perspective, managing a waiting list by prioritising patients based on their age, dental stage and urgency of need rather than in a sequential fashion in order of referral can provide better treatment outcomes, be more cost-effective and allow a meaningful performance measure to be established.

The purpose of this OD project is to develop a protocol to standardise the assessment, prioritisation and management of IOTN5a patients within one regional orthodontic unit using the NCEC Guidelines. A process improvement for prioritising IOTN5a patients for interception at the assessment, based on clinical evidence will improve access to treatment for IOTN5a patients. A KPI can measure the effectiveness of implementation of this process. When implemented, sharing information with referring dentists and parents can improve the timing of referral.

### **Potential threats to implementation:**

**Patient Factors:** Variation in aetiology, in dental development and chronological age, referral age and other patient factors may make it difficult to define protocol.

**Service Factors:** The unit is running at reduced capacity with 5WTE's (from 6WTE's in 2014) A maternity leave and the expected retirement of colleague reduces capacity to 4WTE's taking new patients off the waiting list until a new orthodontist is recruited. There may be a challenge implementing the protocol with overstretched staff adopting a new process and to manage the existing waiting list and new referrals in an equitable way. There is potential for resistance from others within clinical team and outside the local team to change.

## Chapter 2 Literature Review

### 2.1 Introduction

The HSE established a Quality Improvement Division in 2015. (Appendix 4) Quality services “must be outcomes focused and informed by evidence.” (DCYA,2014) Standard 2.1 from the “National Standards for Safer Better Healthcare” (HIQA,2012) states that there should be “An evidence based process for the development of policies, guidelines, protocols and care pathways.” Processes based on evidence can support clinicians to maximise treatment benefits for patients and minimise unnecessary treatments and care.

In this literature review, I shall examine the clinical evidence for management of IOTN5a cases and also discuss the evidence for cost-effectiveness in orthodontics and key performance indicators.

The concept of “Evidence Based Medicine” was considered to be a “new paradigm” when the term was introduced more than 20 years ago. (Evidence Based Working Group,1992) In an editorial, (Turpin,2003) commented on his surprise that a PubMed search for “evidence-based dentistry” revealed no results in 2003. The same term in 2016 reveals 5225 search results. Groups such as the Cochrane Oral Health Group have been established to summarise research findings and support patients, clinicians and those funding services to make healthcare choices.

### 2.2 Data Search

The literature review used data bases from Pub Med, Medline, Google Scholar in addition to HSE Policy Documents and publications, NHS Policy Documents, publications by the NTPF, SDU, NCEC and HIQA, NICE guidelines, RCS Guidelines and Cochrane Reviews. Key search terms included Quality in Healthcare, Quality Improvement in orthodontics, management of Class II malocclusions, factors affecting treatment outcome and cost-effectiveness of treatment.

## 2.3 Review of themes

### 2.3.1 Management of IOTN 5a cases

#### 2.3.1.1 Introduction

A definition of IOTN 5A was outlined in the introduction. IOTN 5a patients score highly on both the dental health and aesthetic components of IOTN.

There are 3 main treatment modalities for patients with IOTN5a:

**Orthopaedic treatment:** use functional appliances to utilise or modify growth of a deficient mandible while the patient is growing to improve profile and lip competence.

**Camouflage treatment:** Use extractions and fixed appliances at any age to reduce the overjet and accept any mild to moderate underlying skeletal issue.

**Orthognathic treatment:** use orthodontic fixed appliances combined with jaw surgery (OGS) to move the jaw as well as the teeth to correct the underlying skeletal pattern. This can achieve an ideal outcome in non-growing IOTN5a patients with moderate to severe skeletal patterns.

The choice of treatment plan is determined by the aetiology and severity of the malocclusion, but also by the timing of referral and treatment. The clinician's preferences and the patient's age, growth, compliance, motivation and general and dental health will influence treatment planning. Balancing all these contributing factors can make research complex and outcomes difficult to interpret.

#### 2.3.1.2 Effects of treatment

“Effectiveness of treatment” is defined as “the provision of care under conditions that are more relevant to the setting under which the proposed care is routinely provided.” (O'Brien et al, 2003). The concept of functional appliances and growth modification was first introduced in the orthodontic literature by Robin in 1902. The Clarke's Twin-Block, developed in 1982,

(Clarke,1982) is now widely accepted as the removable functional appliance of choice, due to cost, compliance and range of action. (O'Brien, 2015 retrieved from [www.kevinobrienblog.com](http://www.kevinobrienblog.com)) Numerous studies demonstrate the dental and skeletal benefits of functional appliances in the mixed to early permanent dentition in growing patients for:

1. Dentoalveolar changes with tooth tipping.
2. Skeletal changes with maxillary restraint, mandibular growth and glenoid fossa changes
3. Differential eruption, improving overbite and molar relationship.

(Pancherz,1982, Mills,1991, O'Brien et al,2003). A recent meta-analysis summarised that evidence indicates that Twin-Blocks are effective in improving Class II malocclusion, although their effects are mainly dentoalveolar, rather than skeletal. (Koretsi 2015) Although the main perceived benefit is in the anterior-posterior dimension, by reducing the overjet and rapidly improving the Class II molar relationships, twin-blocks can provide treatment benefits in all 3 dimensions. Vertical and transverse correction can be very challenging in a non growing patient and can also require surgical intervention.

#### **2.3.1.3 Treatment Changes**

Many studies have concluded that functional appliances achieve a statistically significant increase of about 2mm in mandibular growth during active treatment in addition to larger dentoalveolar changes. (Mills,1978 Mills,1983 Tulloch,1997 Tulloch,1998 O'Brien,2003, Gill,2005 Cozza,2005, O'Brien et al,2009) Mills reported an average increase of 4.2mm in mandibular length. Most abstracts focus on mean responses and differences, but studies also report a large variability of skeletal response and in growth and compliance. (Tulloch,1997 O'Brien,2009) Many studies also include non responders. One RCT showed favourable or highly favourable mandibular growth in 81% of patients compared to 31% in controls. (Tulloch,1997) O'Brien reported that 14% of the overall overjet reduction was due to mandibular growth. (2003)

#### 2.3.1.4 Timing of treatment

In 2013 the Cochrane Oral Health Group (Thiruvengkatachari et al,2013) published a systematic review on 'orthodontic treatment for prominent upper front teeth in children'. This was updated from the Cochrane Review in 2007 by Harrison et al. From a data collection of 1572 publications, they included 17 studies (50 references) for a quantitative meta-analysis. The key finding was that early treatment (age7-11) reduced the risk of trauma to the upper incisors. There was no evidence of any other benefits to starting orthodontic treatment for prominent front teeth before age 11. Another systematic review (Pacha,2015) also concluded that there was no benefit to early treatment with fixed or removable functional appliances. The most recent systematic review (Sunnak,2015) concluded that there was a lack of evidence to prove that treatment before the age of 11 carried additional benefits to later treatment. The authors noted that this does not necessarily mean that early treatment is ineffective.

Some studies have promoted the importance of timing treatment during the pubertal growth spurt (Cozza,2005) but others have highlighted the difficulty in predicting and timing this (O'Sullivan,1983). Many studies are in children younger than peak growth.(Tulloch,1997 O'Brien et al,2003)

One of the most comprehensive pieces of research in this area was a large prospective multicentre randomised control trial in the UK. (O'Brien et al 2003a 2003b) Longer term follow up was reported in 2009 and this research was included in the Cochrane systematic review.

Patients were assigned to early treatment or to a control group which waited a minimum of 15months to start treatment later, many of whom still had functional appliance treatment. Groups were matched for mean age, overjet and PAR score (a measure of the overall severity of the malocclusion.) The results showed that early intervention was successful in reducing overjet, improving the molar relationship and that there was statistically significant skeletal change of 1.9mm compared to the controls, whose mean overjet and skeletal pattern got slightly worse. However, the later group showed more favourable skeletal change. Patients

starting treatment at 11.5 benefited from 4.2mm of favourable growth (natural plus enhancement.) (O'Brien,2009)

#### **2.3.1.5 Risk of trauma**

IOTN5a patients have an increased risk of dental trauma.(Nguyen,1999) The Cochrane Review (Thiruvengkatachari et al,2013) concluded that the only benefit of early treatment was to reduce the risk of trauma. Koroluk (2003) investigated incisor trauma in an RCT, by assigning children to groups for early intervention or one in which treatment was delayed until the permanent dentition. During the trial, there was an increase in the incidence of trauma, but there was no significant difference between the groups. The authors concluded that to reduce the risk of trauma, orthodontic treatment would have to start very soon after incisors erupted. Chen (2011) concluded that as the majority of dental injuries were minor, there was no cost-benefit for early intervention to prevent trauma.

#### **2.3.1.6 Profile Changes**

O'Brien(2003b) showed that immediately after treatment, the profiles of the early treatment group were perceived to be significantly better than the control group. The authors attributed this to a reduction in overjet and an improvement in lip posture (lip competence).

Quintão(2006) reported favourable soft tissue facial profile changes following functional appliance therapy with twin blocks. A recent systematic review (2015) examining profile changes in Class II patients reported that extraction of premolars negatively affected the nasiolabial angle and lip posture. A study in Galway (Burden,1999) concluded that camouflage treatment to correct overjet was best suited to patients with very proclined upper incisors, suggesting this is most appropriate only for milder skeletal discrepancies.



### **2.3.1.7 Patient factors**

The World Health Organisation (WHO) defines health as a state of “complete physical, mental and social well-being and not merely the absence of disease or infirmity.” Social issues can be related to their dental appearance. (Shaw,1980 Joury,2013)

A relationship has also been established between physical appearance and social attractiveness. A visible malocclusion can result in low self concept, teasing and bullying (Obrien,2003b Shaw,1991). Orthodontic research has historically focused on clinical and occlusal outcomes. Authors have outlined the need for patient-centred research and to develop outcome measures in orthodontics that reflect patient values in addition to provider values. (Vig,1999 O'Brien,2013)

A number of studies have focused on quality of life (QoL) and self concept when looking at orthodontic and orthognathic outcomes and many have used the Piers Harris self concept scale. O'Brien(2003) reported that early treatment patients had a significantly increased self concept scores and reduced negative social experiences. There was no significant difference between the early and later treatment groups. (O'Brien,2009).

It has also been suggested that individuals with increased self worth and self care are more likely to perceive the benefits of treatment, whilst non seekers of treatment may be unable to perceive the extent of their malocclusion. (Vig,1999). Cunningham (2001) assessed QoL improvement in orthognathic patients and determined that patients who cared about their malocclusion and perceived a higher treatment need achieved more improvement in QoL after treatment. Johnston (2010) reported that untreated Class II patients had the lowest levels of happiness with their dental appearance, compared to other orthognathic patients and controls.

### **2.3.1.8 Compliance with treatment**

A number of studies have examined compliance with twin-blocks, with non-compliance rates ranging from 14% (Gill, 2005) 17%(Harridine,2000) to 34% (O'Brien et al,2003) An NHS report in 2011 outlined that 20% of the budget was spent on failed treatments. O'Brien reported a 16%

non-compliance rate in his early treatment group (O'Brien 2003a) but a 34% failure rate in the older treatment group (average age 12.3)(O'Brien 2009). Banks (2004) concluded that patients younger than 12.3 when they started treatment were significantly more likely to complete functional treatment with twin-blocks. Although prominent front teeth can incite teasing or bullying, some children reported that teasing and bullying was worse with the appliance. (O'Brien 2003) Studies published by Joury 2011, 2013) explored the influence of patient and family factors on treatment success and concluded that maternal support and household social class had the highest positive influence.

### 2.3.2 Quality Improvement and Key Performance Indicators

There are a number of ways quality can be evaluated and improved within a service. Donabedian (2002) describes 3 essential fields in evaluating the quality of health care, combining:

1. **Structure:** equipment and personnel (buildings, equipment, materials staff numbers and experience/competence)
2. **Process:** actions to evaluate and treat patients. (processing in the service that affect patient experience and satisfaction level)
3. **Outcome:** results for patients. (completed Treatment, dropped out, terminated, adverse outcomes etc)

I have assessed these in relation to the orthodontic service. (Appendix 5)

The Health Information and Quality Authority (HIQA) was established under the Health Act in 2007 to promote safety and quality in the provision of Health Services. "National Standards for Better, Safer Healthcare" (HIQA 2012) recognised the use of performance indicators to monitor, evaluate and continuously improve the quality of care. Up to 30% of the healthcare budget in

Ireland (HIQA,2012) is spent on managing and storing data and defining indicators, developing information systems and evaluating results, so it is important to measure what matters.

HIQA published “Guidelines on developing key performance indicators and minimum data sets to monitor healthcare quality” (2013) Effective KPI’s can assist health professionals in measuring, regulating and improving health outcomes and can be classified according to their function of care, such as screening, diagnosis, treatment and outcomes. Data should allow performance to be measured in a meaningful way to improve services efficiency, quality and safety. HIQA (2013) recommends a number of stages to develop KPI’s:

1. Define the use of the measurement and whether the goal is benchmarking or quality improvement.
2. Consult with the stakeholders and advisory group
3. Choose the area to measure
4. Achieve a balance in measurement using balanced score card (Kaplan and Norton, 1996) or a 3 E’s perspective (efficiency, economy and effectiveness)
5. Determine selection criteria
6. Define the indicator
7. Identify the target population
8. Identify the target to be achieved
9. Define the threshold for action
10. Action.

### **2.3.3 Cost Effectiveness in Orthodontics**

The 2003 World Oral Health Report stated that there was limited evidence that orthodontic treatment benefits oral health. Benson (2015) reported that 10% of the NHS dental budget is spent on orthodontics and discussed the importance of measuring the value of orthodontic treatment. Demonstrating ‘value for money’ for healthcare services demonstrates good

governance (Deans,2009). Economic evaluation can be used to support decision making. Most services have finite resources such as staff, time, facilities and funding. By evaluating health outcomes in terms of both clinical effectiveness and relative cost, poor systems or processes within the service that contribute to poor access to treatment for eligible patients, overspending or reducing or services in other areas can be identified. Economic evaluation and implementing processes to reduce cost can allow better allocation of services. Drummond (2015) describes 4 main types of analysis for economic evaluation:

- **Cost-effectiveness evaluation** is characterised by analysis for both costs and outcomes where to outcomes may differ. These studies express effectiveness in a single dimension as a direct comparison of cost.
- **Cost-minimisation analysis:** This is a type of cost effectiveness analysis where the expected outcome of the two treatment methods is the same and the aim is to identify the least expensive method.
- **Cost-utility analysis:** This focuses on both the cost and the quality of the health outcome, eg for health related quality of life studies.
- **Cost-benefit analysis:** This can be used for evaluating vaccination or screening programs. It evaluates health outcome in monetary units.

A systematic review of health economic evaluations in orthodontics (Sollenius,2015) only used 8 studies in the final analysis from an initial search yielding 1838 studies. This demonstrates that there is still very little good quality evidence evaluating the economics of orthodontic interventions. The authors concluded that the lack of evidence did not demonstrate lack of effect but the urgent need for further high quality economic analysis to support orthodontic interventions. They also noted that most of the research was predominantly from Sweden which has a publicly funded orthodontic service. Large scale RCT's are very expensive to set up. Øvretveit highlighted cost as one of the main challenges with health care evaluation. (Øvretveit,2003) The review included O'Brien's multicentre RCT from the UK (O'Brien,2009),

concluding it was of moderate quality and was a cost-minimisation analysis. O'Brien's study reported no significant difference between the early and late functional appliance treatment in terms of clinical outcome, based on skeletal pattern, extraction rate or self-esteem, but that early treatment incurred higher cost, of \$3913 v 3018\$. (Sollenius,2015) A Finnish study attributed most of the variation in cost to the appliance used, the patients' age at the start of treatment, the number of missed appointments, differences between health centers and PAR changes. (Jarvinen,2001)

Another study compared treatment costs and treatment outcome in the public orthodontic service in Finland (Pietila,2013). They retrospectively assessed early and later treatment groups and concluded that although the mean operating costs were higher in the early treatment group, there was a great variation in both groups and cost-effectiveness was not directly associated with timing of treatment. Interestingly, they also reported that general dentists and therapists were on lower salaries but needed longer appointments to complete tasks, so did not always reduce operating costs. Hodge (2015) also reported that specialist orthodontists were more efficient and achieved better treatment outcomes, compared to other operators. Another study concluded that the effectiveness of treatment provision was influenced by the grade of operator, the choice of treatment methods and by the departmental attitudes and aspirations. (O'Brien,1995) Richmond et al (2004) developed cost-effectiveness models to quantify the performance of individual clinicians working in self-employed and salaried clinics. Costs and effectiveness of the clinicians in each clinical setting show considerable variation, but the authors concluded that orthodontists working in community clinics were the most cost-effective, followed by hospitals and self-employed orthodontists. (Richmond et al 2005) One of the challenges of evaluating cost of treatment is the complexity of patient factors, appliance costs, overheads and individual clinician productivity and assistant time. Due to the variations in clinic set up, it can be difficult to make comparisons between services or countries, so there is an advantage to evaluating relative cost rather than direct cost (Sollenius,2015 Deans 2009)

Most of the research into cost effectiveness of treatment has been led by countries with public orthodontic services where there is benefit to maximize use of finite resources. Much NHS orthodontic treatment is delivered in private practice on a fee per item basis, so the onus is on the practitioner to be cost effective. There is also research from Canada where many patients use insurance to pay for treatment highlighting the value of using performance measures and quality assurance to evaluate the benefit of treatment and justify insurance payments. (Lavelle, 2004)

A study in the UK evaluated the cost of orthognathic surgery (Kumar,2008 Kumar,2006).This multicentre retrospective study assessed factors influencing the cost of combined orthodontic and surgical treatment. The average total treatment cost was €6360 (€3835-€12150) Orthodontics accounted for approximately 25% of the cost, Joint Clinics 10% and the major costs were operating theatre costs and inpatient care. Differences in costs between the units was unexplained but the authors suggested this may be reflect differences in clinical practice, efficiency and surgical difficulties. A retrospective study in the USA (Panula 2002), determined an average cost of \$6206 for orthognathic cases and reported that the surgical phase accounted for 61% of the cost (28% for the operation) and orthodontics 39%.

#### **2.4.Implications for the project**

The literature supports the view that twin-block appliances are clinically effective reducing the overjet, improving profiles and improving self-concept in patients who get them at the right time and wear them well. The Cochrane Review reported that the overall level of evidence was not strong. Another meta-analysis of the evidence for Class II treatment concluded that whilst many of the measured changes were statistically significant, but may be of limited clinical significance individually, when combined they reached clinical importance (Ehsani,2014)

There are so many patient variables affecting treatment outcome and large variation in treatment response, it may be difficult to relate cost-effectiveness directly to the timing of treatment. However, the literature outlines that there is no evidence supporting treatment under 11 and that it was likely to be less efficient, less effective, take longer and be more expensive. (Thiruvengkatachari,2013 O'Brien 2009). The evidence does suggest that children who received functional appliances at around age 11.5 had better mandibular growth than the younger or older age groups,(O'Brien,2009) and children had better compliance with functional appliances before the age of 12.5 (Banks,2004). As compliance rates dis-improve with age, it is likely to be less cost-effective to be fitting late functional appliances in children over 13.

It is worth noting that children in the UK go to secondary school at age 11 and Irish Children starting secondary school are usually aged 12. It is very possible that a change of school and a new peer group affects compliance in addition to chronological age. The twin-block is bulky and may be tolerated better in a National School classroom rather than in a large secondary school environment, but this has not been fully explored in the literature. Starting treatment after the first premolars have erupted (usually age 11+) simplifies appliance retention, compliance and treatment efficiency, reducing the need to pause while teeth erupt. (Birnie,2014). Although the majority of the treatment change is dento-alveolar, most clinicians will agree that it is more challenging to achieve an ideal outcome in adolescents, whether this is due to lack of growth or lack of compliance.

The literature supports the view that providing twin-block appliances for IOTN5a patients who will benefit from them between the ages of 11 and 13 would minimise costs compared to treating younger or older children.

Later treatment for many IOTN5a patients may be a compromise both for the patient and the service. Whilst camouflage treatment can be offered at any age, it is most suitable for children

with proclined incisors and less severe skeletal patterns. Non-growing IOTN5a patients with moderate to severe skeletal discrepancies may need to accept a limited treatment outcome or undertake treatment involving orthognathic surgery, which can be more demanding for patients and significantly more expensive for the service.

Orthognathic surgery(OGS) is also a very limited resource within the service with long waiting lists, so not readily available for all those who may benefit. The literature supports the view that whilst OGS can be hugely beneficially physically and psychologically for patients with the most severe orthodontic problems, it is not cost-effective for that service to absorb a backlog of older IOTN5a patients who could have benefited from a twin-block appliance.

## 2.5.Summary

Best clinical practice and effective treatment planning should encompass the best evidence, clinical experience and patient factors.(O'Brien 2015)



**Figure 1: Evidence Based Practice.**

David Sackett (1996), one of the forefathers of evidence based medicine, highlighted that research evidence should not tyrannise clinical decision making but allow doctors use both their clinical expertise and the best external evidence to reduce the enormous variability in practice patterns. It is appropriate to summarise that it is likely that there is an ideal window of



opportunity (age 11-13) for many IOTN5a patients where treatment will be efficient and effective and appliances will be well tolerated with good compliance.

There is a value for the service to develop a protocol to identify IOTN5a patients who will benefit from functional appliances and provide them with treatment at an appropriate time, to improve quality and cost effectiveness. The protocol should not hijack clinical decision making, but support clinicians with a standardised operating procedure to act as a guideline for applying the most efficient and effective treatment and provide transparent and equitable access to care.

## Chapter 3 Organisational Development Process

### 3.1 Introduction

The literature outlines the potential benefits of offering functional appliances to growing patients with prominent front teeth, both from a patient perspective, from a clinician perspective and from a service perspective. This project will standardise this patient journey and introduce and measure the new quality standard.

Without organisational change, organisations fail to thrive, develop, progress and survive. Moran (2000) described change management as “continually renewing an organisations direction, structure and capabilities to serve the ever changing needs of internal and external customers. The HSE orthodontic service is relatively young and has expanded rapidly in the last 15 years. Like all organisations, it will benefit from a continuous process of change to examine what, why and how our service can improve.

### 3.2 Critical evaluation of organisations development processes

Weick and Quinn (1999) differentiate between episodic change, where one strategy or programme is replaced by another and continuous incremental change. Many changes in organisations respond to emergent problems, but it is also useful to anticipate and plan for change with OD programmes. Strategic Management theory outlines that whilst some organisations are static with no strategic plan and react only to ‘put out fires,’ mature strategic management is a process of continuously improving.(Rohm, 2008)

Akerman(1997) distinguished between three types of change: developmental, transitional and transformational. Developmental change is continuous incremental and may be planned or emergent.

Lewin (1951) describes a 3 phase process of Transitional change

- 1.unfreezing of the initial equilibrium, helping others to realise the need for change and minimising resistance

2. moving to a new status by taking action to implement the change
3. refreezing the new position to stabilise the change and create acceptance of the new equilibrium.

Critics suggest the Lewin model is too simplistic and that it masks the real challenges of change such as the context, sequence and pace. (Bartunek,2014) Transformational change can radically alter the structure, process or culture of an organisation.

A SWOT analysis (Ansoff,1965) can be used to describe the strengths and weaknesses, opportunities and threats of the planned intervention and identify priorities. The main principle of SWOT is to consider the internal and external factors simultaneously. It was developed to encourage whole system thinking in corporate strategy. Glaister and Falshaw (1999) reported that SWOT was one of the most widely used strategic planning tools. (Appendix 4)

D'Herbement(1998) described a model for describing the different perspectives stakeholders can hold towards a change process. A stakeholder analysis (Appendix 5) can identify which stakeholders have the most importance or influence on the change process. Some of these have a synergistic, positive effect on the process, whilst others are antagonists. Some are active, albeit in a positive or negative way and others will be passive. A team may have 'zealots' who are positive and supportive; "that would be fantastic if we could make that happen" and 'schismatics'; "go for it, but it didn't work before, what's the point?" They describe how important it is to 'sell the change process' within the team, as passives and waverers may be the largest group and change is more likely to be successful if you can lead those who are willing and manage the negative impact others may have.

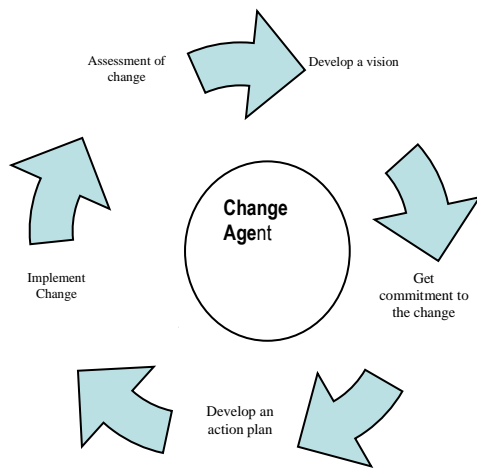
Many studies have explored the importance of understanding power, resistance and organisational culture whilst implementing change. In a true hierarchy, leadership is positional and the most senior person adopts responsibility. Goffee and Jones (1998) highlighted the

importance of non-hierarchical leadership and that good leadership centres on the relationship between the leader and those being led rather than on seniority.

Most formal decisions on service planning in the HSE are top down, but in reality, the 'followers' in the clinical front line affect how the organisation functions. Baker (2007) highlights the role for followers to share leadership roles and not be passive stakeholders. Within a complex organisation like the HSE many of those in leadership roles are non-clinicians and rely on the input of the followers to plan services and their commitment delivering them. Fleming (2014) outlined that in a rational organisation, the leaders and followers work together towards a common goal, but in others, power and politics can obstruct the change process and focus on disagreement, debate and deliberation on what that goal should be. Lewin (1951) developed a "force field analysis" to identify the conflicting driving and restraining forces in play when implementing change.

Ford (2008) highlighted the role of the change-agent influencing resistance to change and that leadership requires self awareness and awareness of others during the process. Kotter (1995) developed an eight step model for managing a change process, from establishing a vision for change to implementing and sustaining change. Although it was not evidence based when it was established, it has been used widely, but it does not take the continuous cycle of change into account.

Senior and Swailes (2002) described the Organisational Development model for Change. This is a cycle, revolving around a "change agent" that drives the change. Others describe the agent as the 'change champion,' but Ford (2008) highlighted the bias of assuming that the agent is always doing the right thing whilst the change recipients are putting up barriers.



**Figure 2: Senior and Swailes Model of Change 2002**

Deming (1986) developed a cyclical PDSA model, based around Plan, Do, Study, Act. Given the value in continually adapting and reviewing change processes, a cycle of change is most appropriate in a healthcare setting.

### 3.3 Rationale for OD Model selected

I chose the HSE Change Model for this project as I believe it is a good fit for this project. By using it, writing about it and reflecting on this process and my learning, I shall have the tools to implement further changes within our service using a “toolbox” that is understood by those who support quality and performance management in the HSE.

### 3.4 HSE Change Model

The HSE Change Model was developed by the organisational development and design unit. (Improving Our Services. HSE,2008) It was adapted from Kotter’s 8 steps (1996) and number of other change models and change theories and outlines a 4 step process for initiating, planning implementing and mainstreaming change within the service, and key points to consider at each stage. Although it breaks the change process into stages, it highlights that change process should be continuous.

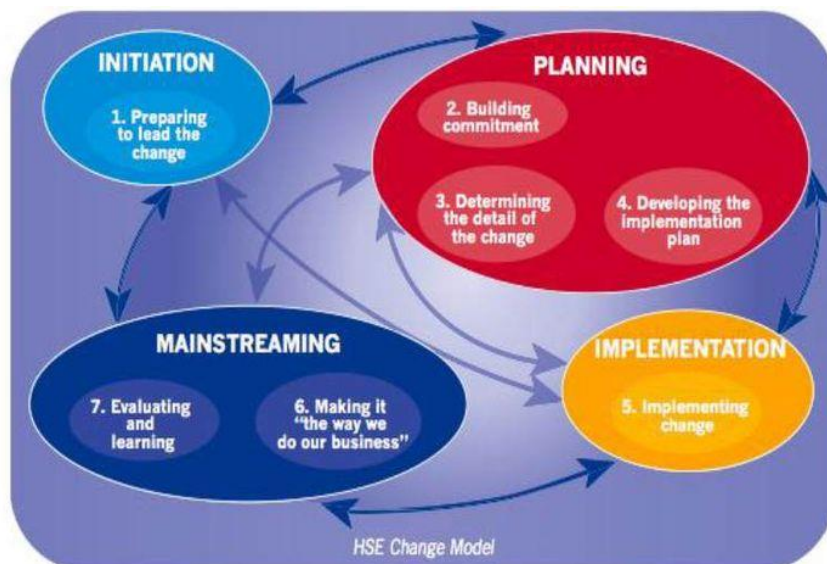


Figure 3: HSE Change Model

### 3.4.1 Initiation

The Initiation phase of the change identifies the need to preparing to lead change and identifying the need and purpose of the change:

#### 3.4.1.1. Evaluation of my service

Donanbeidan (2000) outlined the 3 dimensions of quality improvement as structure, process and outcome (Appendix 4)

**Structure:** The unit is purpose built in 2001, with 7 single surgeries and a hygienist room. There is an Electronic Patient Record (EMR) using Orthotrac in Windows XP, which is orthodontic specific practice management software, but a paper chart is also generated for every patient. The 5 clinicians are fully qualified specialist orthodontists and have all worked in the unit for more than ten years.

**Processes:** The unit manager is very process driven and proactive, ensuring there is protected clinic time for new patient assessments and allocating patients for treatment. We meet the national KPI targets for the service.

There are no standardised protocols for how patients are managed following assessment. This allows a high level of clinical freedom for long standing and experienced staff and may contribute to retention of staff. It also means that some inefficiencies or inequities may not be

easy to identify, less experienced clinicians may be pressurised by parents, there is no formal clinical support and a large variation of practice may lead to inequality accessing the service.

**Outcome:** There are very few complaints and no IR issues within the unit. An national audit in 2015 using PAR scoring (Richmond,1998) measured a high standard of treatment outcome.(unpublished)

#### 3.4.1.2. Understanding the need and scope for change

The planned change is a process change for eligible IOTN5a patients. The literature outlined the evidence on the timing of treatment. Best practice in managing waiting lists encompasses:

1. Providing people-centred patient pathways
2. Reducing clinical variance with standardised protocols
3. Organising the care continuum (planned process)
4. Process improvement

(Technical Guidance to Demand and Capacity Planning,SDU,p24)

There is a National Standard for eligibility for HSE Orthodontic Treatment.(Appendix 3) At the assessment, the clinician completes an index card with the assessment findings. [Not Eligible, Eligible IOTN5a, or Review [in Observation(OBS) or Assessment Review AssRV)] The EMR patient status is changed to IOTN5a for eligible patients with a recall date for the date they were put on the waiting list. Patients are taken off the waiting list in sequential order.

The clinicians, understanding that timing of treatment is critical for many IOTN5a patients, started prioritising some patients at assessment, who they felt were more urgent than the standard waiting time. As there was no set standard, there has been a huge variation whether patients are prioritised, how the decision is made on when they should be called and on where and how this information is recorded.

By October 2015, about 1/3<sup>rd</sup> of patients on the IOTN5a waiting list had comments to prioritise them and they ranged in age from 8-14. There was also a huge variation in how clinicians recorded assessment information to prioritise patients, either on the EMR or paper chart. So many patients had “call by” comments, that no patients had come off the main waiting list for months. Many of the patients on our IOTN5a waiting list were put on the list in a climate when we expected them to be called in 12-18months, but our waiting time has increased significantly since 2013, due to reduced staff levels.

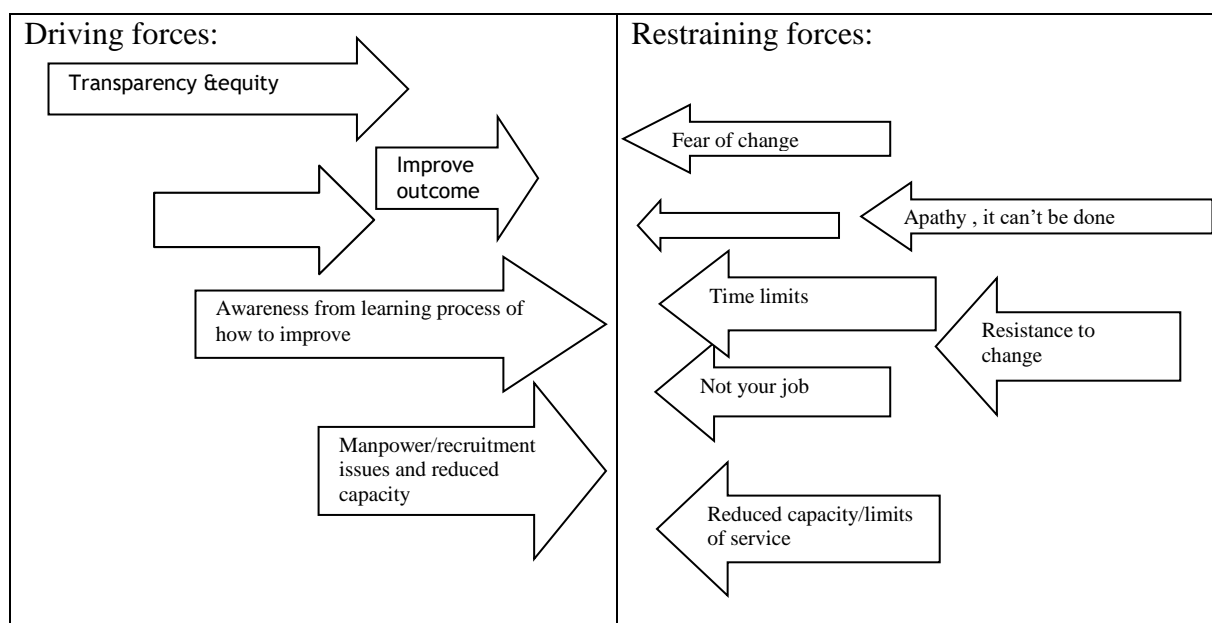
Clinicians periodically manually rechecked charts of older patients on the IOTN5a waiting list as remedial action to try to identify urgent cases. This requires use of administrative time to pull the charts and re file them and clinician time to review and revalidate when to call the patient. This ad hoc system was effective in identifying and prioritising many patients for functional appliances but this deviation from the chronological list was not standardised and was creating extra work. Best practice guidance outlines that clinicians should not be controlling or interfering with a waiting list. (NTPF,2012)

Our Unit Manager is highly organised and process driven and although the clinical rationale for prioritising IOTN5a patients was well intentioned, the lack of process for the clinicians to justify who, when and how to prioritise patients was making it more complex for her to allocate patients into treatment in a fair way or indicate to patients when they may be called. Eligible IOTN5a patients were effectively being allocated for treatment from 3 sources; the sequential list, the prioritised patients and the older patients identified by the remedial checks. This contributed to a lack of ownership of the problem and lack of strategic overview. This coupled with the reduced capacity from staff vacancies and the increased volume of young referrals was making the waiting list unbalanced and unmanageable. ‘Operational grip’ is “the extent to which there is clarity of purpose, predictability and accountability” (SDU,p8) Process change is often required to understand demand, match capacity and embed effective operational processes that are behind the scenes rather than a non-systemised approach that relies on individual effort.



The need and purpose of the change was to establish an evidence-based protocol of standardised clinical guidelines for the clinicians to use at assessment to determine and record when treatment should start. We also needed to standardise recording this information on the EMR and move away from the paper system. This would allow waiting list responsibility to revert to the administrator without clinician interference, with clinicians supporting this by recording assessment outcome in a clear and standardised way.

The degree of urgency was highlighted by the temporary decrease in staff numbers and capacity. The IOTN5a waiting list had increased from 188 to 273 during 2015 and 85 patients on the IOTN5a list were over 12, already starting secondary school and would be potentially too late for functional treatment without intervention. To assess the impact on people, I completed a stakeholder analysis (Appendix 5) and analysis of the drivers.



**Figure 4: Lewin's force field analysis of drivers.**

The service is hierarchical and I was aware of the organisational politics associated with this. I identified the stakeholders both externally (my line manager is the consultant in another unit, the service manager, the referring dental team, the national oral health office) and the internal unit team. I was able to communicate the vision for change both formally through email and

meetings and informally at work and by telephone and ask for input. The clinicians agreed they did not want to be “firefighting” in the future, managing a backlog of older IOTN5a patients, so the level of interest was high. Change is more sustainable if the process is aligned with the values of the stakeholders. (Burnes,2011) The impact of change would be positive for the older children who needed functional appliances, but it would affect younger children. The team expressed concerns that we were changing the goalposts for those patients by not calling them when they expected. There was general concern that the waiting lists were growing and frustration that the vacancy had not been advertised. We also agreed that the loose system of prioritisation was unfair. Clinicians felt some patients were ‘leapfrogging’ the waiting list and some “urgent” patients should have been prioritised, highlighting variation in clinical decision making.

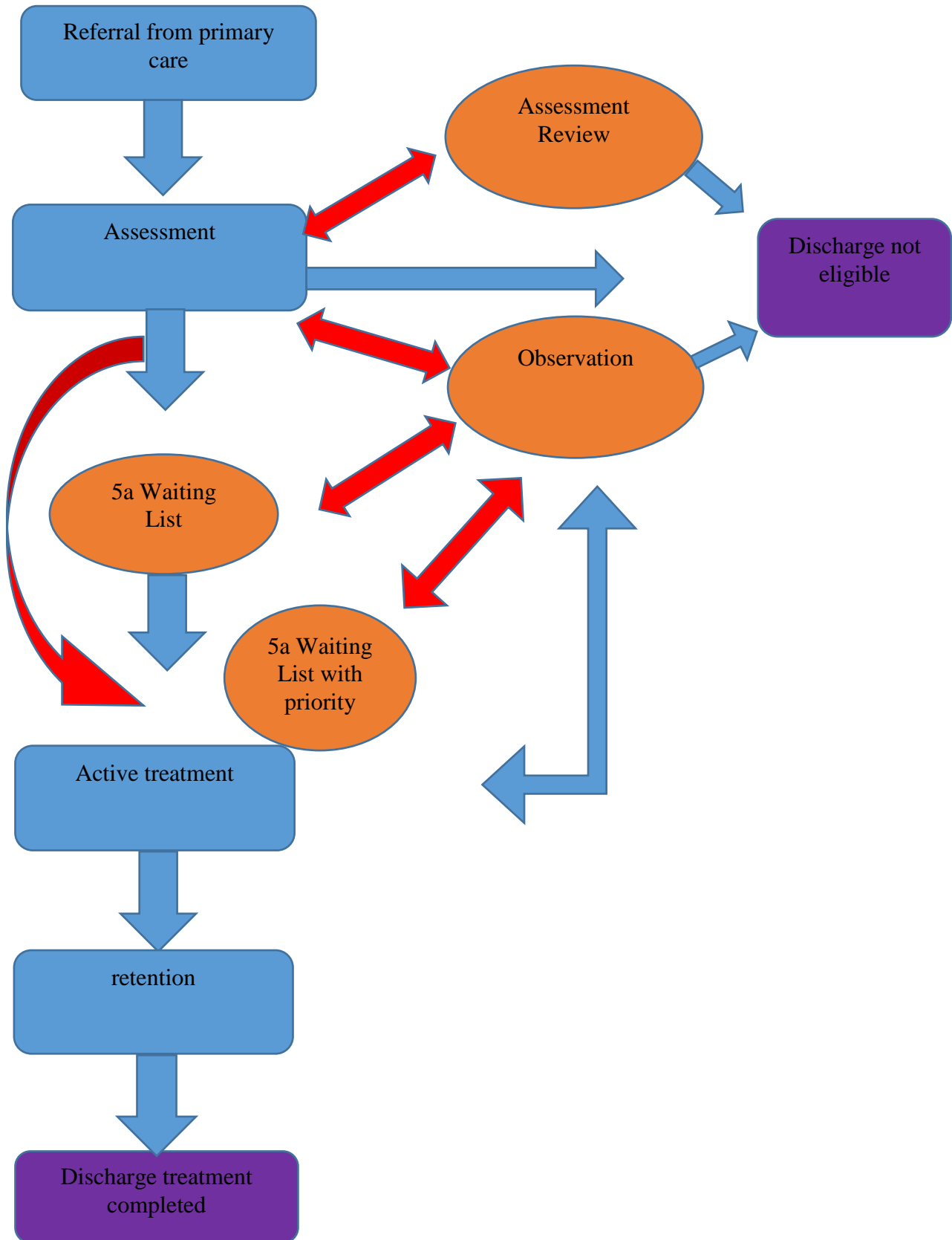


Figure 5: The patient journey chart shows the classic patient journeys (blue) and the alternate journeys (red), highlighting the variation in outcome of assessment.

### 3.4.1.3 Understanding the Patient Journey

Understanding complex patient pathways is part of any process improvement agenda. (SDU, p24) Managing waiting lists needs a whole system understanding of where patients wait and why to identify any bottlenecks affecting capacity.

Once ethical approval was granted I was able to review completed IOTN5a cases from 2015. Orthotrac facilitates patient tracking as patients have a “status” at each stage of the patient journey. Figure 5 outlined the patients’ journeys.

A search identified 301 patients who completed IOTN5 treatment in 2015 and chart review determined that 115 were IOTN5a. From the paper chart, index card and Orthotrac notes and data, recorded the date of referral, date and age at assessment, date and age active treatment started and finished, date of discharge and number of appointments attended and number of appointments failed(DNA). The system does not differentiate between appointments with the hygienist and with the orthodontist, so the total numbers of appointments listed combines both. I also reviewed the clinical photographs and radiographs to look for evidence of incisor trauma and to assess the treatment outcome. A compromised outcome was recorded for patients with poor occlusion or alignment or decalcification and comments on poor compliance were noted.

### 3.4.1.4 Outcome

The patients who completed treatment and were discharged in 2015 had been referred between May 2002 and May 2013 with an age range of 5-16 at assessment, showing a wide variation in the time patients spend in the system and age range. The outcome of the assessment was not standardised for eligible IOTN5a patients. Some patients went into observation if they were deemed too young for the waiting list, other young referrals were placed on the treatment waiting list, some had been discharged and re-referred. About 1/3 of patients had notes on the index card to indicate when they should be called. The average waiting time for treatment was 23months with a range of 1-70months. There were several routes into active treatment from the

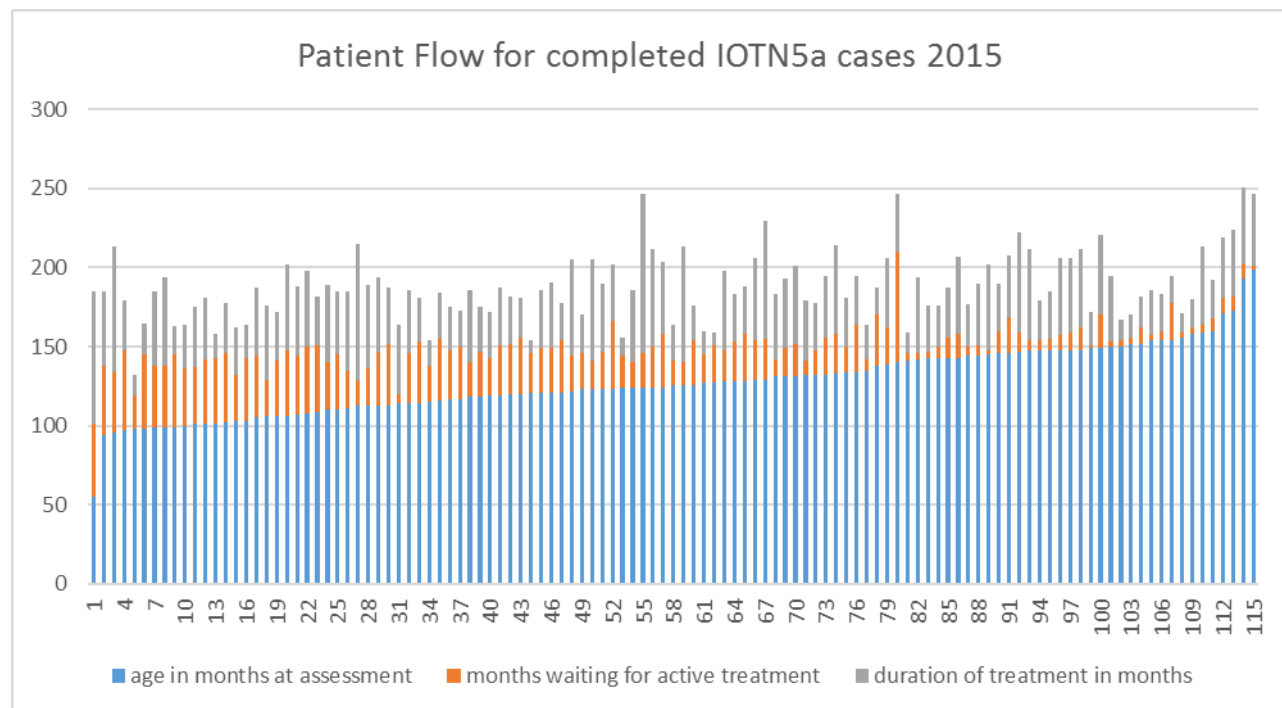
waiting list, priority list and from OBS. The overall incidence of trauma was low with only 9% of patients having trauma at the start of treatment.

treatment by appliance type:	TB	fixed	OGS
number of patients	93(90*)	20	2 (5*)
mean age at assessment (months)	126	132	143
range	55-173	97-199	124-199
mean age active treatment started(months)	149	154	205
range	101-182	140-202	201-210
waiting time for active treatment in months	22	22	37
range	(3-46)	(2-51)	(5-70)
Mean Overjet (mm)	10.3	9.2	12
range	(9-15)	(8-10)	(10-15)
mean number of appointments	35	34	56
mean number of missed appointments(DNA's)	2.5	2.6	17
mean number of pretreatment appointments	5	5	13
mean number of appliances(incl remake/repair/URA)	1.3	0.25	0.6
% patients who had extractions	15	70	40
% patients with a compromised outcome	15	30	55
total active treatment time (months)	37	31	55

**Table 1: Patient Journey Analysis Data**

The data confirmed the perception that the twin-block appliance had been the treatment of choice for 80% of the patients who had completed IOTN5a treatment. For the functional patients, 80% of them had started active treatment between 11 and 13 and 90% of those patients had achieved a close to ideal outcome, compared to 80% for the group as a whole.

For patients over 11.5 at assessment, 79% who had functional appliance treatment had been prioritised. The majority of patients treated with fixed appliances were over 11.5 when they were assessed and waited an average of 12 months to be called. They were more likely to have extractions. The average DNA (did not attend) rate for the fixed and functional appliance was 2.5 appointments with a range of 0-15. The fixed appliance cases had on average 34 visits compared to 35 for the functional cases and this also included the pre-treatment visits.



**Figure 6: Comparison of time waiting for active treatment by assessment age.**

One of the bottlenecks identified was that patients had an average of 5 appointments before an appliance was fitted. Patients over 11.5 at assessment averaged 3 pre-treatment visits but children under 10 at assessment averaged 7 pre-treatment visits. Figure 6 shows that patients who were referred young waited longer to start active treatment. (the orange area) Some patients allocated for treatment, waited in OBS rather than commencing treatment, indicating most clinicians did not have a preference to start treatment in very young children. The younger patients who did start active treatment were more likely to have a removable appliance (URA) in addition to the functional appliance, either before or after the twin-block. There was a total of 1.3 appliances per patient including all breakages, repairs, remakes and additional appliances.

There were very low numbers of orthognathic (OGS) patients, indicating that the ad hoc system of prioritisation was effective. 3 of the OGS patients who completed treatment in 2015 had been planned for surgery following an unsuccessful 1<sup>st</sup> phase with a functional appliance. One had been discharged for poor attendance and was re-referred. All three patients who had had poor compliance with functional treatment had poor compliance and poor attendance during the OGS phase with an average 55 visits and 17 DNA's. 2 of the 3 patients did not proceed with the surgery. The duration of treatment and delays may burn patient compliance, but these failed treatments are an excessive drain on resources and patient selection is critical. An NHS report in 2011 outlined the need to reduce spending on low clinical value treatments. OGS is expensive to provide and should not be a fall back for patients who have not coped with other treatment. 2 patients who were planned for OGS from the outset had successful outcomes. One was a late referral at 15 and one was unsuitable for a twin-block.

The patient journey data is aligned with the evidence from the literature review. Cost-minimisation relies on the appropriate timing of referral and treatment or the appropriate management of early referrals to reduce pre-treatment appointments. Late referrals may miss the ideal treatment window. The patients treated with camouflage with fixed appliances and extractions had a lower start overjet than the other groups, confirming that this is not ideal in severe cases. OGS is a valuable service for patients with the most severe discrepancies and in a cost-effective service should be limited to patients who are highly motivated and do not have an acceptable alternative treatment option.

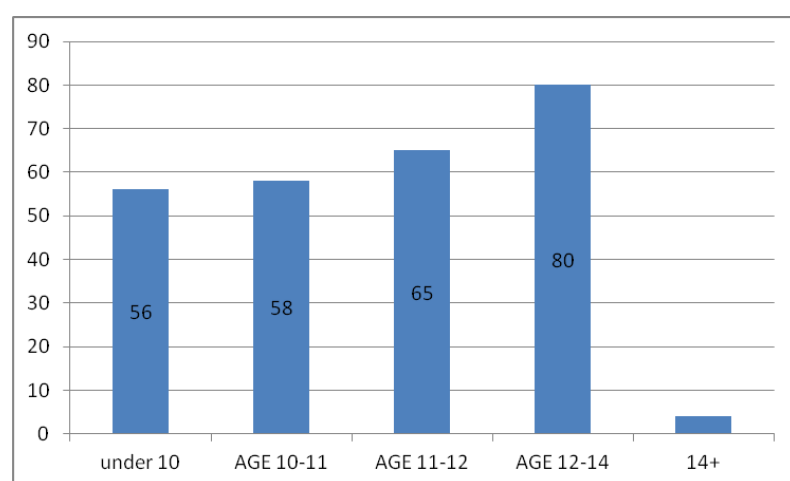
The ad hoc system has been successful in identifying some patients who are referred late and getting them into active treatment. This is reflected by the high numbers of patients being treated with functional appliances and the low numbers requiring OGS. However, our methods for prioritising are not consistent or efficient.

### 3.4.1.5 Understanding the Waiting List

When we discussed the number of pre-treatment appointments at the planning stage it was clear that the clinicians felt a duty of care for their own cohort of patients, whilst the waiting list was “outside of our control” and “the HSE’s problem.” This identified the culture as “fragmented” (Goffee and Jones 1996) with high levels of individual autonomy and providing the best care for their own patients with little interdependence or ownership of the waiting list. Responsibility for an unsurmountable list can contribute to burnout, but we also needed to share responsibility for the ‘bigger picture’. As patients may be referred following their 2<sup>nd</sup> Class, 4<sup>th</sup> Class or 6<sup>th</sup> Class dental assessment or older, there is a large range of patient age, dental stage and urgency of the referred group and on the waiting list. In October 2015 there were 263 patients on the IOTN5a WL with an age range of 7-20. They had been referred between 2011 and 2015 and placed on the waiting list between June 2013 and Sept 2015.

Waiting list start of month:	total	5A
Jan-15	732	188
Jul-15	814	273
Oct-15	879	263

**Table 2: Waiting List pre implementation.**



**Figure 7: IOTN5a Waiting List October 2015 by age.**

Figure 7 shows the age profile of the IOTN5a waiting list. However, some of the youngest patients had been waiting longest on the sequential list whilst many of the older patients had been added in 2015 following a 6<sup>th</sup> Class assessment.



### **3.4.2.Planning**

#### **3.4.2.1 Introduction**

At this stage we had a shared vision for the project. Some clinicians even stated “we are doing this already” as they already prioritised IOTN5a patients, so the proposed process change to revise and standardise this was well accepted.

At the team meeting in October 2015, we were informed there had been no recruitment process for our retiring colleague and the patients should be transferred to the remaining 4 clinicians. It was proposed to stop all assessment clinics and not take any patients off the waiting list to facilitate this. This compromised both the project and our delivery of care for patients in treatment. The initiation phase had identified 80 patients over 12 on the IOTN5a list. The evidence outlined the cost-effectiveness of functional appliances at 11-13. Followership theory states that followers should not be passive stakeholders in clinical decision making. (Baker,2011) The clinicians made a case for a locum, using the waiting list data, to outlining the implications of not starting functional treatment for the IOTN5a patients. No new OGS patients had been assessed to start treatment since May 2014 due to limited capacity, so there was a cost-benefit to treating IOTN5a patients now to avoid the potential impact of a backlog of non-growing patients needing OGS. An agreement was made for a locum and our colleague delayed retirement for a second time to continue to work part time with another clinician covering 0.2WTE. This allowed the project to continue.

#### **3.4.2.2: Preparing the protocol**

In addition to using the HSE Change Model, I used the 2015 NCEC standards for clinical practice guidance to develop the clinical protocol. Clinical practice guidance is a “systematically developed statements or processes to assist clinical and patient decisions about appropriate health care for specific clinical circumstances.” (NCEC,2015) All clinical guidance is underpinned by evidence based criteria and can included policies, procedures, protocols and guidance.

<b>NCEC CRITERIA:</b>	
<b>Patient Safety</b>	<ul style="list-style-type: none"> <li>• Dental Council regulations outline clinicians ethical and moral duty to protect the safety of patients.</li> <li>• identify bottlenecks in accessing the service.</li> <li>• Increased demands/morbidity/risks of OGS.</li> <li>• Reduced capacity, temporarily. Transfer cases from departing colleague also affected capacity for new patients.</li> <li>• There was a need for a robust system to identify and prioritise patients whose outcome may be compromised by waiting.</li> </ul>
<b>Burden of Clinical Topic:</b>	<ul style="list-style-type: none"> <li>• morbidity may be affected by more complex OGS treatment</li> <li>• self esteem and risk of trauma improved by the intervention.</li> <li>• High volume of calls to the unit wondering when children will be called. Parents ask “is it ok to wait” and a guideline on the timing of treatment can clarify this.</li> <li>• Patient journey data identified the clinical preference for TB’s and the high quality of outcome associated with this.</li> </ul>
<b>Evidence analysis</b>	<p>The literature review outlined the evidence of the timing of treatment, including clinical factors, patient factors and cost and quality measures.</p> <ul style="list-style-type: none"> <li>• No benefit to treatment under 11</li> <li>• Skeletal changes optimised at 12</li> <li>• Compliance reduces after 12.5</li> <li>• Self esteem and profile improved by functional</li> <li>• Camouflage may be a compromise unless incisors very proclined.</li> </ul>
<b>Economic impact</b>	<ul style="list-style-type: none"> <li>• reduce the number of pre treatment appointments</li> <li>• reduce early treatments and patients in OBS</li> <li>• reduce demand for OGS</li> <li>• streamlining should improve capacity in the service</li> <li>• IOTN5a patients have an indicative date to facilitate service planning.</li> <li>• Patients may opt out of HSE waiting list if waiting time is long or may decline OGS treatment or accept limited treatment option. May be more economical in the short term, but may have a negative impact on staff engagement and retention.</li> <li>• OGS is significantly more expensive to provide.</li> </ul>
<b>Variability in Practice</b>	<ul style="list-style-type: none"> <li>• The review of the retrospectively treated cases did not show a large gap between current clinical practice and evidence based practice</li> <li>• variation in practice has led to more pre treatment visits for young patients</li> <li>• some older patients not being prioritised as we do not have a standardised procedure for managing referrals by age.</li> <li>• This may also help to reduce the number of young referrals.</li> <li>• The local HSE dental service is not routinely offering 4<sup>nd</sup> Class dental checks. Referrals from 2<sup>nd</sup> Class may be too young and 6<sup>th</sup> Class too late, so we need to manage this in a way that does not compromise quality.</li> </ul>
<b>Potential for Improved Health</b>	<ul style="list-style-type: none"> <li>• evidence that overjet reduction improves health outcomes.</li> <li>• dental health benefits of improving lip competence and reducing the risk of trauma</li> <li>• psychosocial benefits to improve social and mental well being higher chance of a healthy and attractive dental future.</li> </ul>
<b>Clinical Guidelines Implementation.</b>	<ul style="list-style-type: none"> <li>• It is feasible to implement a guideline</li> <li>• no obvious barriers to implementation</li> <li>• set a gold standard for implementation to allow the standard to be measured.</li> </ul>

Table 3: The 7 criteria for Clinical Protocol Development

### **3.4.2.3 Determining the detail for the change**

I had assessed the current situation against the future change, by analysing the waiting list at 1<sup>st</sup> Oct 2015. Analysis of the patient pathway, the current waiting list and age variation and the evidence on the timing of treatment assisted in defining the purpose and the need for change.

### **3.4.2.4 Designing the detail of the future state**

What needs to change:

- patients under 11 not being allocated for treatment unless there is an exceptional reason
- patients who may benefit from a functional being called before they are 12.5, ideally in 6<sup>th</sup> Class
- Waiting list and patient allocation controlled by administrator
- Patients allocated an indicative date at assessment of when treatment should start.
- This should be between 11.5 and 12.5 to suit variation in gender, school year, growth spurt and dental age and developmental stage. Very excessive overjet or social issues can also be considered.
- Patients who are too young or dentally immature for an indicative date should not be put on the treatment waiting list.
- Reassessment at age 11 allows examination for other orthodontic anomalies and an indicative date to be given at that stage.
- Keep patients in AssRv or on the waiting list until they are likely to be ready for treatment and not allocated to a clinician to reduce pre-treatment reviews.

### **3.4.2.5. Preparing for Implementation**

Remedial action was used to allocate the backlog of older IOTN5a patients for treatment. On 11<sup>th</sup> January 2015, I circulated an implementation plan document to all the clinicians and unit

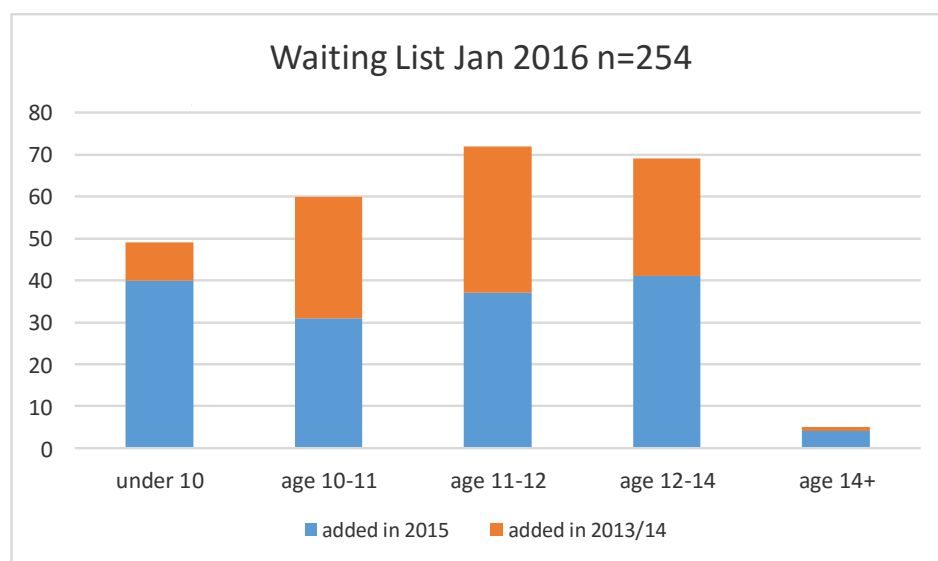
manager both by email and in print. It summarised the rationale, evidence from the literature, SWOT analysis and the proposed protocol with a view to piloting it. (Appendix 7&8)

The first assessment clinics for 2016 were booked on 21<sup>st</sup> January and the team meeting was scheduled for 25<sup>th</sup> January, so this gave everyone a chance to review the new protocol and contribute to discussing and improving it at the meeting. The implementation plan was forwarded to the national oral health office, who referred it to the orthodontic consultant group. The PCRC approval required approval from the Chief Dental Officer to fully implement the protocol.

### 3.4.3 Implementation

At the initiation and planning phase there was a high level of engagement from the clinician team. The implementation would only be successful if the team continued to support it. Concerns had been for the patients who had been placed on waiting list on 2013-14. The patient journey data addressed that younger patients may not start treatment earlier, but may absorb extra appointments and indirect costs. Due to the remedial action, many of the new patients allocated to treatment in the previous 3 months were IOTN5a and clinicians wanted a more varied case mix. Clinicians highlighted that patients with impacted canines IOTN5i or 4c may also be urgent, and that prioritising IOTN5a patients was inequitable for other patients waiting. This was the first resistance to the change and it was well founded. There were conflicting priorities regarding the impact of the process change on the main waiting list. Resistance to change can manifest in many ways including passive avoidance, so I encouraged all viewpoints. Ford (2008) highlighted that change can be change-agent centric and that resistance to change can be thoughtful and considered and positively influence the change process. Clinicians expressed legitimate concerns for other unmet demand, whilst we had reduced capacity. Applebaum (2000) identified the enormous economic potential for healthcare services if transforming leadership can implement effective survival techniques in the short term and at the same time plan for success in the long term. All patients are important, but we had

identified that delaying IOTN5a patients' treatment during our staff shortage would have more serious long term effects for them and for the OGS service.

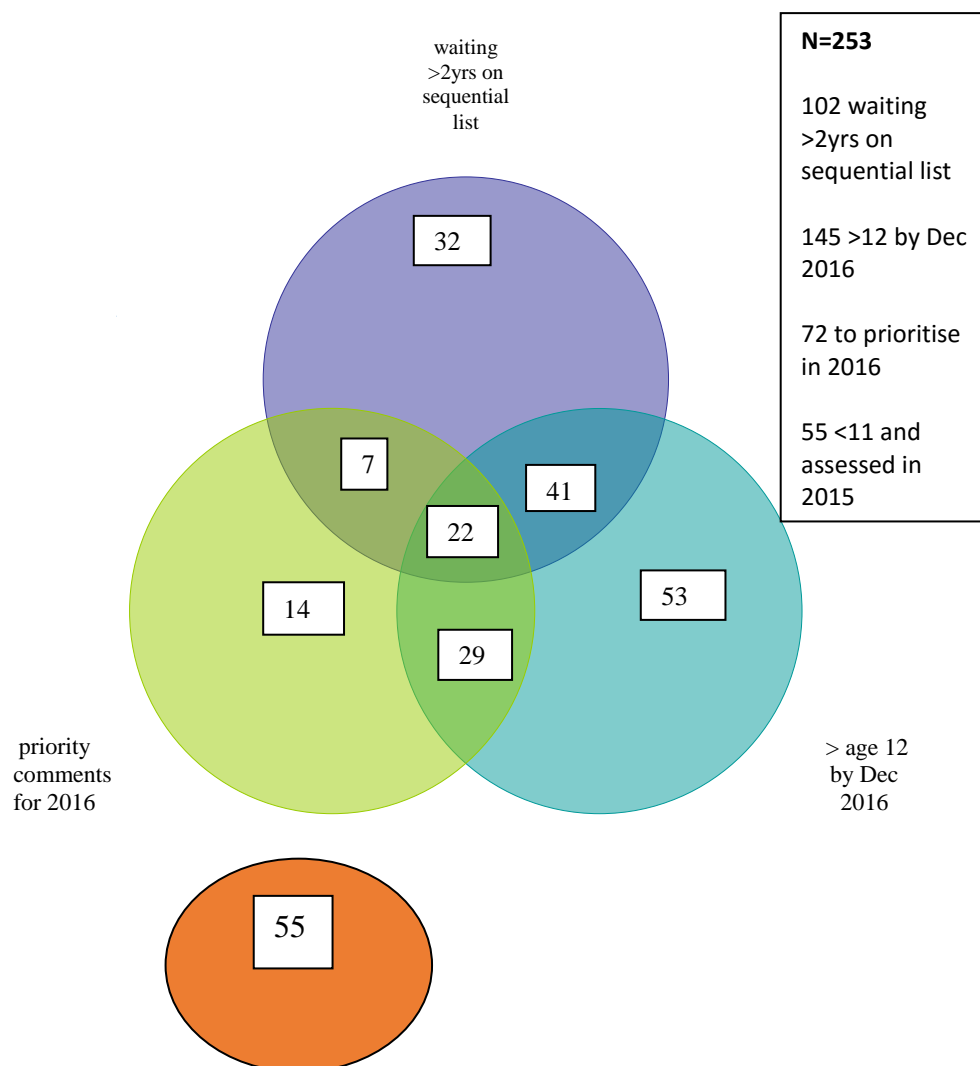


**Figure 8: IOTN5a waiting list by age and assessment date January 2016**

Figure 8 shows that if we called the next 102 patients from the sequential list, (those added in 2013 and 2014) 39 of them would still be under 11 by the end of 2016. 145 patients on the list would be over 12 by December 2016.

Some resistance was based on a perception that the protocol would prioritise IOTN5a patients above other patients, but I believed that taking patients from the sequential list, the priority list and those identified by age was disproportionately increasing the number of IOTN5a patients being taken off the list as there was limited overlap of the 3 groups. (figure 9)

Of the 253 patients on the IOTN5a list, by the end of 2016, 195 were either waiting more than 2 years on the sequential list or would be over 12 and may get called by remedial checks or had a comment to prioritise them for treatment in 2016. Only 55 patients on the IOTN5a list were outside these 3 groups. 53 older patients over 12 had been assessed in 2015 and had no priority comments.



**Figure 9: The 3 sources of IOTN5a patients had little overlap.**

This data reassured the clinicians and we agreed to pilot the implementation plan for the first quarter of 2016 during the period of reduced capacity, in anticipation that the post would be advertised. We agreed to also keep the other priority and sequential lists moving too. There was also some fear of change. Clinicians raised concerns about us taking responsibility for the waiting list when it was “not really our problem” and concerns about upsetting the hierarchy. Delays in filling vacancies led the team to believe the waiting list was not a concern for our service leaders and that ‘managing without’ by improving the service may reduce the chance of vacancies being filled. I struggled to sustain momentum for change and needed resilience. At the end of February, I reviewed charts that had been assessed with the protocol, to check compliance.

### 3.4.4 Mainstreaming

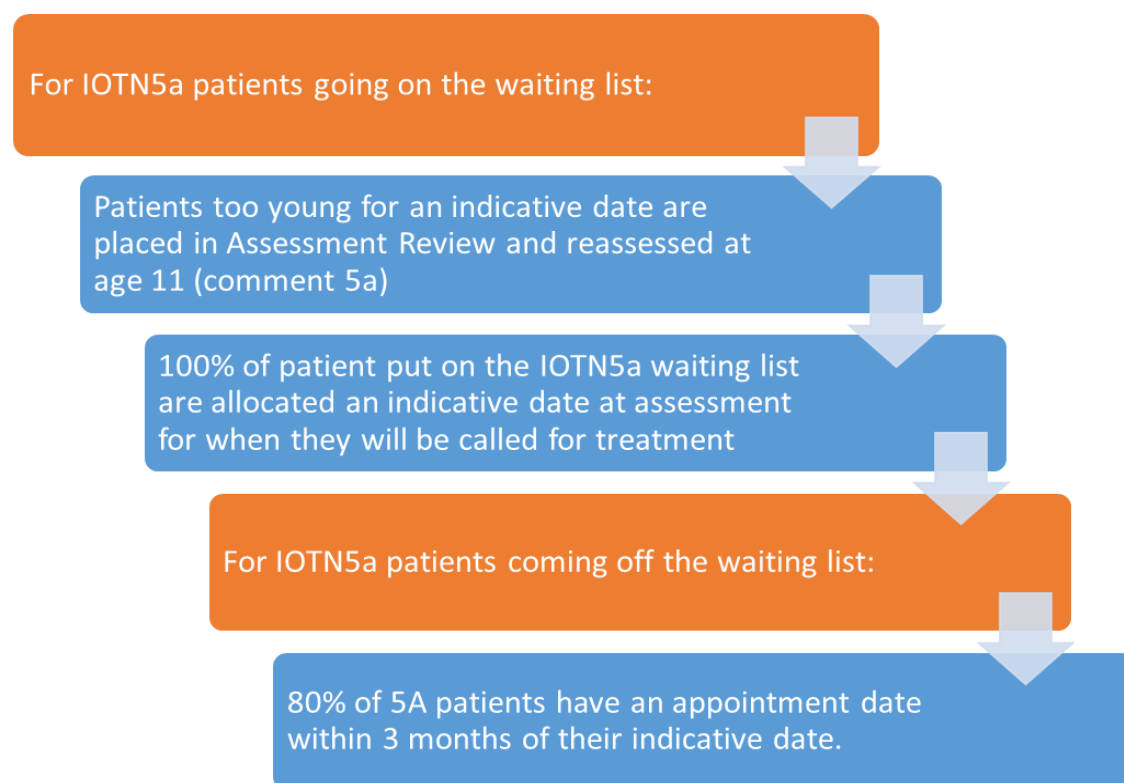
The purpose of mainstreaming is to focus on the positives of what has been achieved. In order to embed the change we need to make it “the way we do business” and this relies on a critical mass supporting the ‘new way’ by their actions.

By April 2016 the protocol was largely accepted and was reflected positively in the minutes of the team meeting. It also gained the approval of the visiting consultant. I was able to discuss the implementation with each clinician and asked for their feedback and input. I needed to understand reasons for non-compliance to adapt, amend and fully embed the protocol. A training session was run at the team meeting to discuss the issues and highlight some of the non-compliant assessments and this was repeated with the DSA’s. The system needed to work without a clinician rechecking charts, but there was an expectation that patients would still be picked up “the old way.” There were lessons from the initial implementation and ideas from other stakeholders, to refine the protocol.

We also had to validate the IOTN5a patients who were already on the waiting list using the protocol as this was the only way that our administrator could have one waiting list for IOTN5a and stop calling patients from both the priority list and the sequential list and the older patients identified by remedial checks. I discussed ways to manage this with the administrators and clinicians, using minimal clinical time and reducing bias and variation, so one clinician reviewed all the charts, to allow a consistent approach. About 1/3<sup>rd</sup> of these patients already had priority dates and others had comments regarding the timing of treatment that were not on the EMR. Using the protocol and based their age, school year, gender, overjet and dental stage, how long they had been waiting and any other relevant information recorded at assessment, these patients were allocated indicative dates. The process change was also discussed with the Principal Dental Surgeon and Senior Dental team, to outlined to the referring dentists.

### 3.5 Conclusion

The HSE Change Model supported this process to initiate, plan and implement a clinical protocol to standardise the information recorded at assessment for IOTN5a patients with an indicative date for treatment to start. This allowed a local KPI to be developed to measure a gold standard for providing treatment for IOTN5a patients at an appropriate time and to evaluate the process and the protocol.(Figure 10)



**Figure 10: New Process with KPI's**



## Chapter 4: Evaluation

### 4.1 Introduction

The final stage of mainstreaming in the HSE Change Model is Evaluation. This process of evaluation and identifying areas of key learning is critical to embedding the protocol but also to having a method for audit and measuring improvement. The Standards for Clinical Practice Guidance (2015) outlines that after implementation, there is a phase of audit, monitoring, review and evaluation. This learning is invaluable for future process improvement .

### 4.2 Significance of Healthcare evaluation

Healthcare evaluation is defined as “a critical assessment through a rigorous process, of an aspect of healthcare to assess if it fulfils its objectives.” (Øvretveit,2003) Evaluation has a critical role in enabling service planners to both measure and continuously improve the effectiveness, efficiency, equity, quality and value for money in the services they manage and demonstrate good governance.

### 4.3 Evaluation

#### 4.3.1 Aims

The purpose of this project was to improve the quality of IOTN5a patients access to treatment. The SMART objectives of the project were to develop and implement a clinical protocol for use at assessment to indicate when treatment should start. This aimed to reduce the age variation both on the waiting list and of those patients being called for treatment and to develop an quality measure (KPI) within the unit for allocating IOTN5a patients to treatment.

#### 4.3.2 Methods and Measures

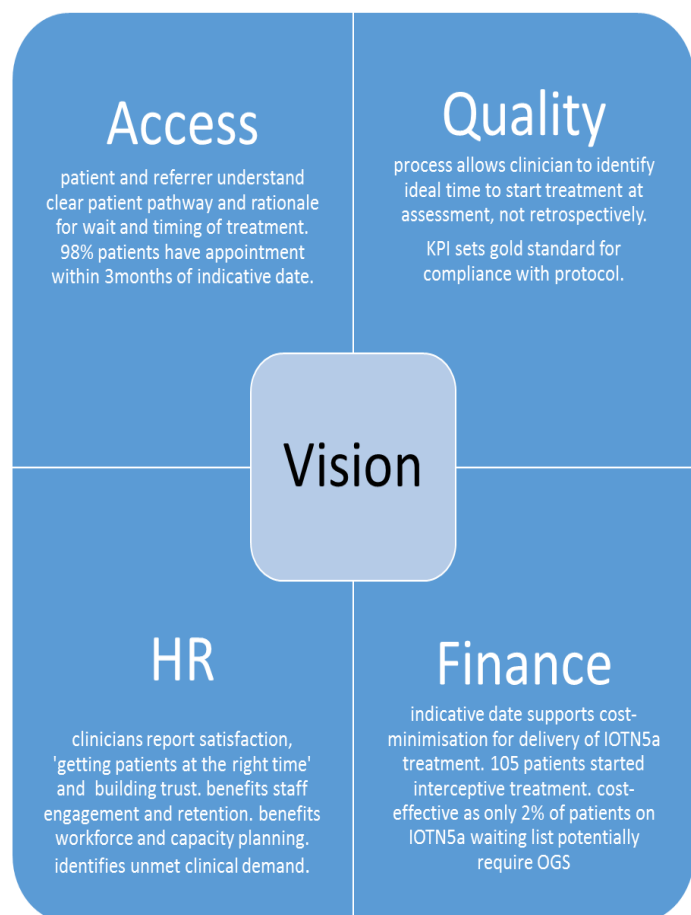
Many different models can be used to measure process, outcome and impact of change. (Øvretveit,2002) CIPP models can be used to evaluate the context, input, process and product,

evaluating the accessibility, effectiveness and sustainability of the outcome. (Stufflebeam,2007)

Other models identify the key factors for successful implementation as seen by various stakeholders. The Balanced Score Card (Kaplan and Norton 1996) is used in both the HSE and NHS to evaluate services from the perspective of the stakeholders. The Health Service Performance Report (HSE,2015) outlines a balanced score card evaluating 4 aspects of performance.

1. Access to services
2. The quality and safety of services
3. Workforce and human relations
4. The financial resources

The advantage of this model is that it can evaluate the process change and quality improvement from the different stakeholder's perspective, including both the effects on patients, on staff and the impact on the service.



**Figure 11: Balanced Score Card for Evaluation**

### 4.3.3. Results

#### 4.3.3.1. Evaluation of changes to Access to services

Introduction of the clinical protocol and indicative dates has structured the IOTN5a waiting list by age, to standardised access to treatment for IOTN5a patients, irrespective of referral age.

Figure 4 in Chapter 3 displayed the IOTN5a waiting list by age in October 2015. The remedial action and the protocol have reduced variation of the age of patients on the 5A waiting list.

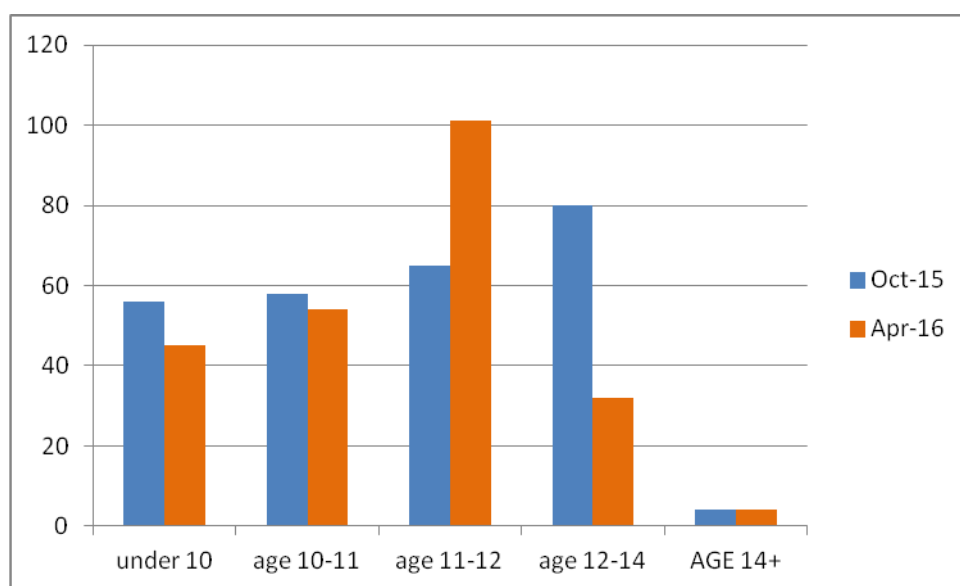


Figure 12: Comparision of IOTN5a waiting list by age after intervention.

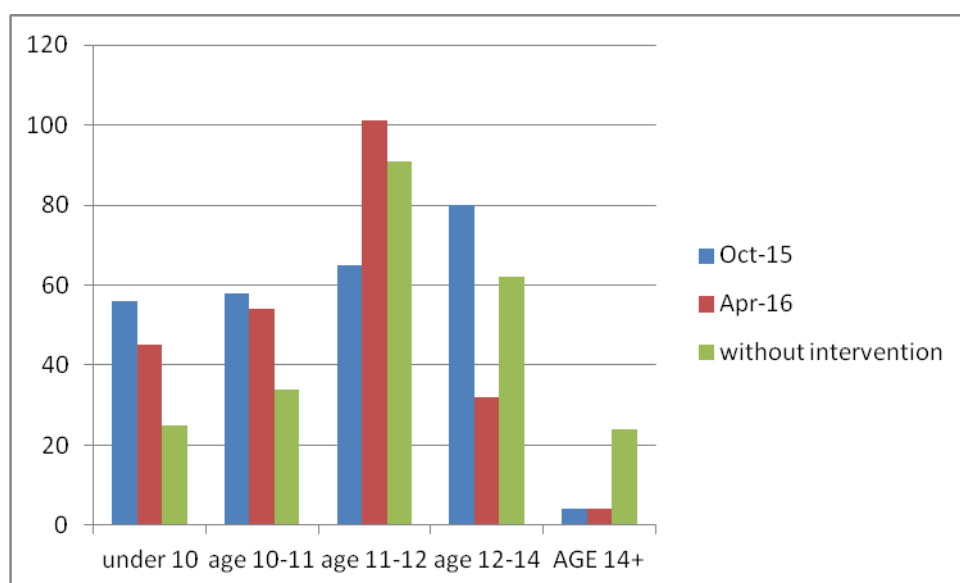


Figure 13: Comparision of IOTN5a waiting list with expected patient numbers without intervention.

Figure 12 compares the waiting list from October 2015 to April 2016. As fewer young children were added to the list and the older children were allocated for treatment, the age profile changed to a more normal distribution, with fewer “too young” or “too old” children on the waiting list. During that period, 115 children were taken off the waiting list and 88 were added. 105 patients aged between age 11.5 and 13.8 years old were allocated to treatment with a view to functional appliances. By April 1<sup>st</sup> 2016, there were 36 children over 12 on the 5A waiting list. 6 have been assessed as not suitable for a functional appliance, 19 have been allocated to clinicians and have appointments and 7 have prospective indicative dates. 4 patients have a date to call before April 2016 but have not been allocated.

Figure 13 compares the current state to the expected state without intervention. If patients had been allocated to treatment by sequential date and priority comments only, 53 children over 12 in October 2015 would still be waiting for treatment. By remedial action and introduction of indicative dates during mainstreaming, these patients were allocated to treatment.

39 patients who had been waiting more than 2 years were identified as too young to start treatment. Keeping these patients on the central waiting list until they are ready to start treatment will reduce their indirect costs of attending additional appointments. The indicative date gives patients and parents a clear guide to when they are likely to be called for treatment and the rationale for waiting, allowing a transparent patient pathway and to build trust in the service.

#### **4.3.3.2 Evaluation of Quality Improvement**

Evaluating the quality of the process change is measured by both the compliance with the protocol putting patients onto the waiting list and by measuring the quality of our service taking patients off the waiting list by their indicative date.

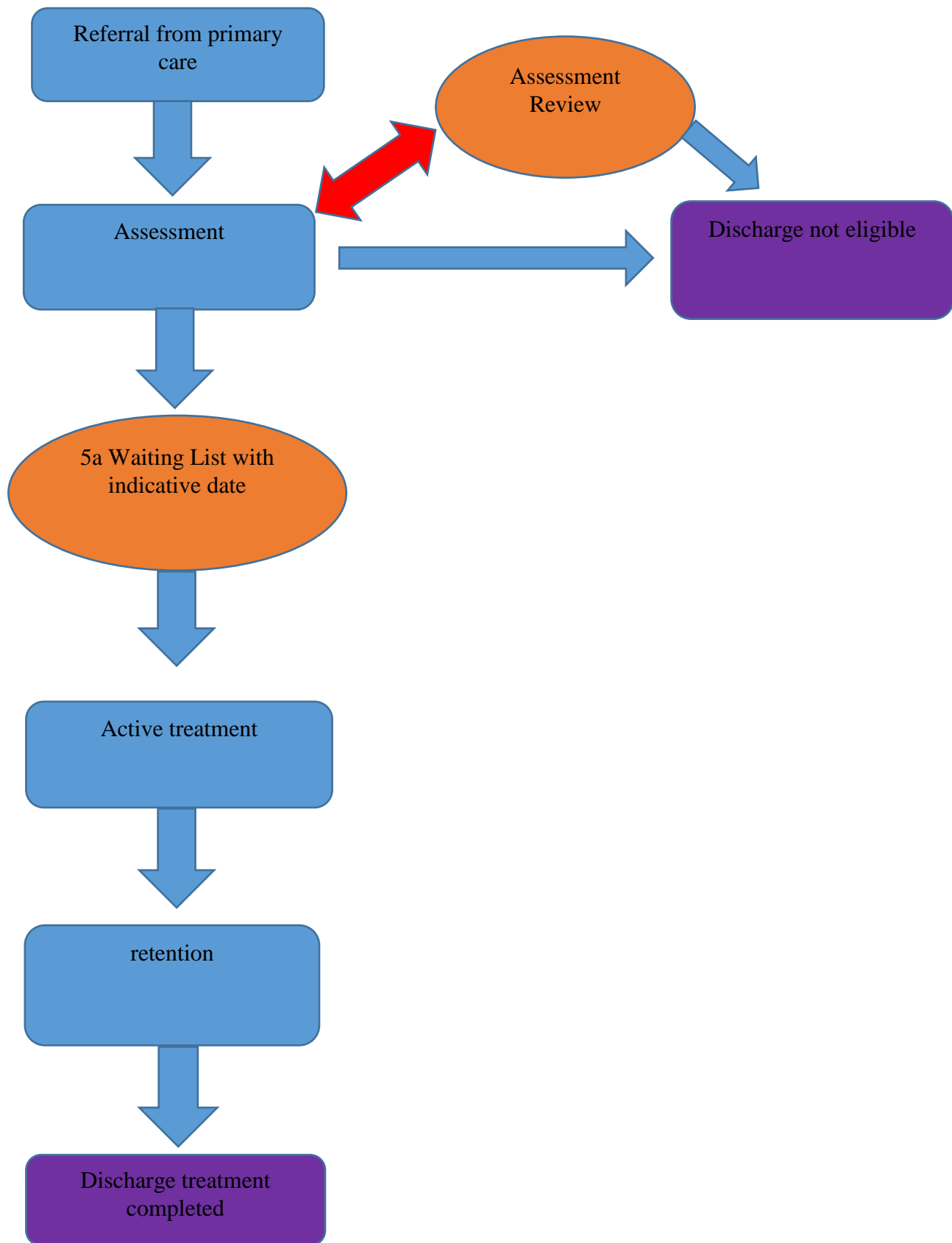


Figure 14: Patient flow process after intervention

KPI's were established for both these measures: (Figure 10

For IOTN5a patients going on the waiting list:

100% of patients put on the IOTN5a waiting list are allocated an indicative date at assessment for when they will be called for treatment

If they are too young for an indicative date, they are allocated to Assessment Review, with a date to be recalled for reassessment and comment 5A

For IOTN5a patients coming off the waiting list:

80% of 5A patients have an appointment date within 3 months of their indicative date.

100% of 5A patients have an appointment date within 6 months of their indicative date.

75 patients referred with IOTN5a were assessed or reassessed in the 3 months to the end of March 2016. 18 patients were placed into AssRV, 7 were not eligible. 50 patients were placed on the IOTN5a waiting list. Compliance with the protocol was measured by reviewing assessment notes and statuses.

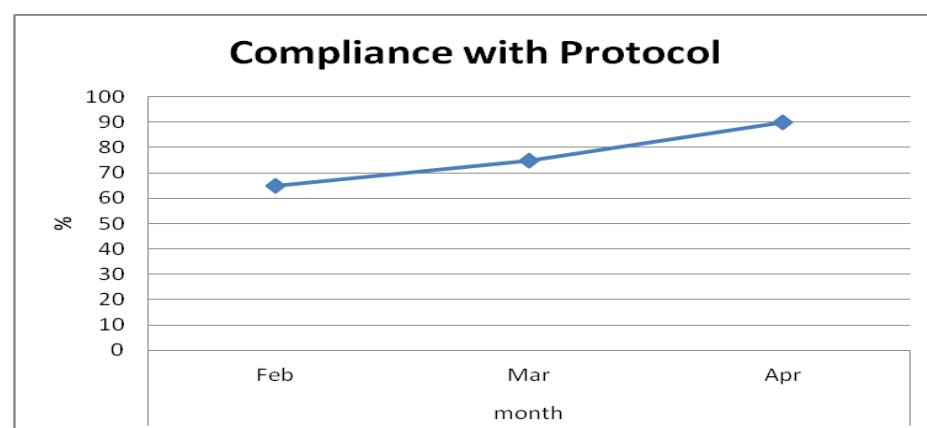


Figure 15: Compliance with the protocol

Following implementation of the protocol, initial review at the end of February indicated 65% compliance for the 31 patients placed on the waiting list. Non compliant cases were discussed with individual clinicians, ambiguity and preferences were discussed and the protocol was refined. Compliance rose to 75% in March.

Non-compliance mainly related to where the assessment information and dates were placed on the EMR, as this was different than “the old way.” There was also a perception that patients would still get called ‘the old way’ and some resistance to change.

The team meeting allowed a further education session to show some screenshots of good comments and of non-compliant cases to highlight common errors. The worded protocol was updated to a visual version with screen shots of where to record the information to reduce errors.(see appendix 8) During the pilot, the education and discussion had focused on the clinicians. As DSA’s often enter statuses and recalls into the EMR, an education session was run with the DSA’s to reinforce the new standard. The DSA’s were very supportive. As they work with different clinicians they were even more aware of the clinical variation and welcomed a standardised process. The consultant approval should also support improved compliance.

The standard of having 100%compliance with the protocol has not yet been met, but a review of the data for April showed further improvement to 85%. The continued success and sustainability of this protocol will rely on continued training and review until compliance is 100%.

### **Setting the KPI:**

Kotter (1995) outlined that removing obstacles to the new vision was a key enabling factor. Only 1/3<sup>rd</sup> of the patients already on the IOTN5a waiting list had any priority comment and the ‘new way’ required validation of this list using the protocol and allocation of indicative dates.

There were 236 patients on the IOTN5a waiting list on April 1<sup>st</sup> 2016.

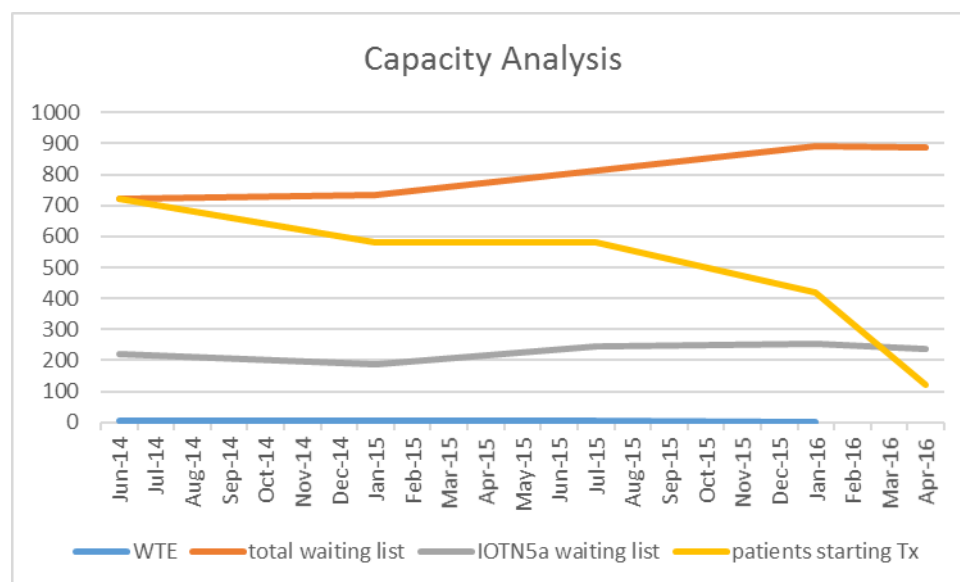
4 patients have indicative dates for March 2016 and had not been allocated by May 2016, so 98% are meeting the gold standard for the first quarter of 2016.

The unit has now established a quality standard for providing treatment for IOTN5a patients.

The indicative dates for IOTN5a patients identify 79 11 and 12 year olds to allocate for treatment in 2016. This demonstrates that there is a very low level of unmet clinical need for patients on the IOTN5a waiting list at April 1<sup>st</sup> 2016. The waiting list is in a constant state of flux with new patients being added and patients being allocated to start treatment, but we are currently meeting demand and our new KPI for IOTN5a. Patients put on the waiting list now outside the protocol or without an indicative date may be disadvantaged. Kotter (1995) outlined that transformation efforts fail unless you consolidate improvements and continue to improve.

#### 4.3.3.3. Evaluation of Human Resources/Workforce factors

Understanding our waiting list allows us to identify who can wait, when patients need to be called and plan workforce requirements.



**Figure 16: Capacity Analysis**

In 2006 when the Modified IOTN guidelines were introduced, there were 7.0 WTE's in the unit. WE had 6.0 WTE's from 2008 until May 2014 when the consultant resigned. As those patients are transferred to the other clinicians, the number of new patients starting treatment is affected. One orthodontist is on maternity leave and one is retiring in June 2016. Figure 15 shows that the reduction in capacity due to vacancies is not meeting the demand for the service. Demand is steady, but the waiting list increases as capacity declines. Treatment commenced for 421



patients during 2015 and 122 patients started treatment in the first quarter 2016 with 48 patients were allocated to treatment in March 2016. Understanding the gap analysis between demand and capacity is key to effective and efficient workforce planning as backlogs can be difficult to resolve.

Before the process change, IOTN5a patients were being allocated to treatment from 3 pathways (sequential waiting list, priority comments, older patient review). The new process has one equitable waiting list. Now that the backlog has been managed, fewer IOTN5a patients will be allocated, allowing more access for other IOTN5 and IOTN4 patients. IOTN5a cases should only account for 25-35% of new patients moving forward, depending on our retiring colleague being replaced.

Having a gold standard for care allows us understand who is waiting and why and to evaluate risk in the service. This process change allowed patients who may be compromised by waiting to be identified and managed that risk by prioritising them to start treatment during the recruitment delays.

## **HR/ Staff engagement**

The level of interest from the clinicians was high and it was not difficult to establish a win for them. Process improvement can benefit clinicians as well as patients. The clinicians have high ethical standards and career satisfaction and staff engagement can be affected by a sense that the system and processes prevent you from doing your best.

Clinicians reported that they felt they were getting patients “at the right time” from the waiting list and that the assessment process was simplified by explaining the rationale for waiting and being able to outline when a patient would be called. Parents often ask “is it ok to wait” so giving an indicative date builds trust and allows professionalism and confidence in the service we deliver. The organisational culture can influence both retention and recruitment of staff as highly

skilled clinicians do not want to provide substandard care. The culture was fragmented at the start of the project with high levels of autonomy, individual case management and no 'ownership' of the main waiting list. There was more solidarity during the process, especially when advocating for a locum and the team meetings supported a more collaborative and communal culture, working towards the goals of the organisation. (Goffee and Jones 1998) The 2015 National Service Plan outlined that the key to quality improvement is to "develop models of front line staff engagement to improve services." Aspects of staff engagement will be discussed further in Chapter 5.

#### **4.3.3.4 Evaluation of Finance aspects**

No additional resources were allocated to the unit to fund this project. The process change was implemented with existing staff members and expenditure, during a period of reduced staff numbers and decreased capacity.

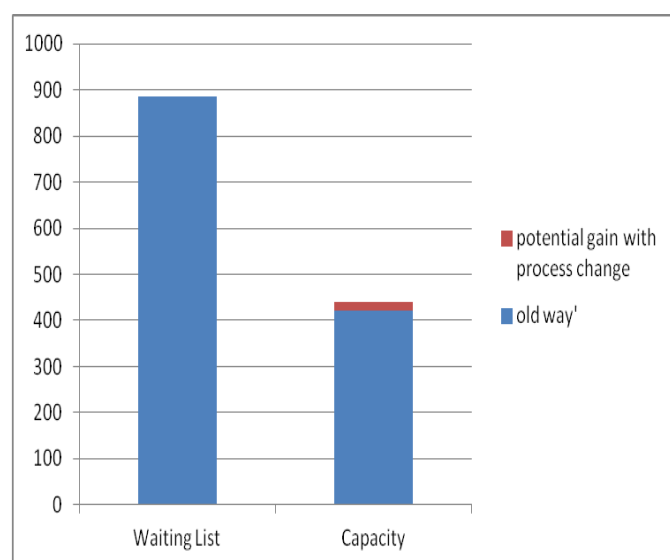
The remedial action allocated older IOTN5a patients into treatment with functional appliances to reduce the potential demands for orthognathic surgery for non growing IOTN5a patients.

The patient pathway analysis outlined the higher financial demand of orthognathic cases. They used more appointment time. These patients also attend planning clinics with consultant orthodontists and surgeons which adds to the cost. The literature review outlined that orthodontics accounts for only 25-35% of the total cost of provision of orthognathic care. there is high potential benefit to the service to provide interceptive care with functional appliances, in line with the HSE Strategy. (DCYA, 2014)

By April 2016, only 4 patients on the 5A waiting list are over 14 and 2 other were identified as surgical cases at assessment, accounting for 2.5% of those waiting. Without the remedial

action, over 20 children over 14 would still be waiting for 5A treatment and may become surgical cases.

Process improvement can improve capacity with finite resources by streamlining assessments and allocation of patients. Each clinician has finite clinical time. The patient journey analysis showed that IOTN5a patients had an average of 35 appointments (average 5 pre-treatment) from referral to discharge. The standardised protocol will reduce the pre-treatment appointments. If 100 patients each had 3 fewer pre-treatment appointments using the protocol, up to 10 extra cases could be allocated to treatment.



**Figure 17: Demand and capacity**

Defining a transparent and equitable patient pathway for referring dentists and parents should also reduce the number of early referrals and the number of children going into assessment review and needing re assessment. This was discussed with the Principal Dental Surgeon. A poorly resourced primary care service can create bottlenecks and reduce capacity. (NTPF,2013,p6)

#### **4.3.4 Dissemination Plan**

Once mainstreaming is established, the clinical protocol and associated performance measure can be discussed at national level with a view to dissemination. Input from the key stakeholders and potential change champions in other units will identify common goals.

Sharing the outcome of this study by publication and presentation of this project can contribute to further process improvements.

The protocol could be refined and submitted to the NCEC to develop a national clinical care pathway if other stakeholders at national level are in agreement. The HSE Change Model and NCEC Guidance could also be used to develop standardised processes for other IOTN grades to reduce variation in management and introduce further quality measures and KPI's based on performance.

#### **4.4 Summary and Conclusion**

Øvretveit (2002) outlined an action evaluation of health programs measuring the objectives, efficiency, acceptability and sustainability of the programme. This chapter has evaluated this process change from the perspective of the different stakeholders using a balanced score card model. Mainstreaming is ongoing and the continued success of the project will rely on continuing to embed the protocol and measuring it's impact with the new local KPI for IOTN5a.

## Chapter 5 Discussion

### 5.1 Introduction

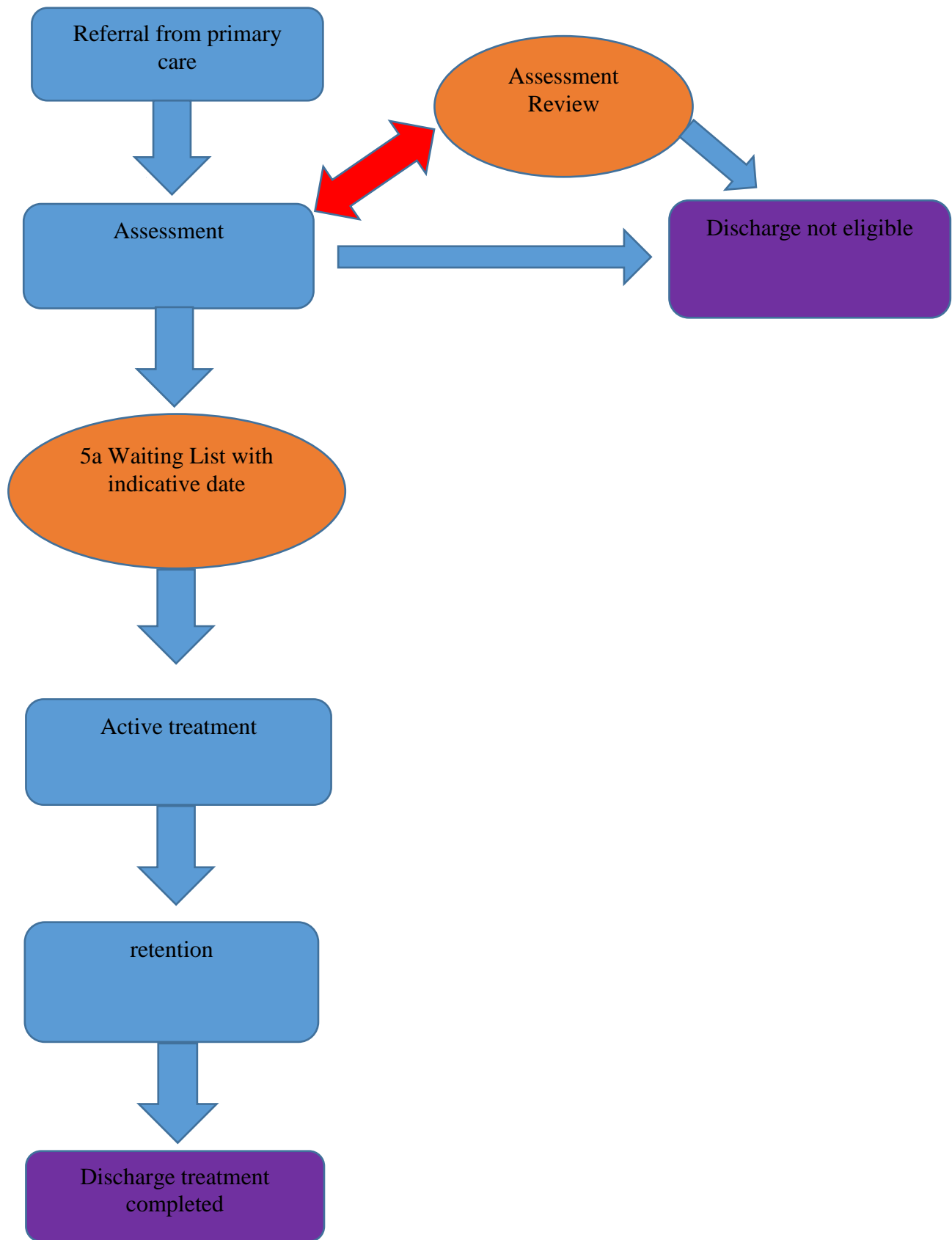
This project aimed to develop a patient centred model for delivery of care for IOTN5a patients by introducing a clinical protocol for assessment. This was a process change for indicating when treatment should start and allocating patients to treatment. This process was successful in achieving the stated objectives. In this chapter I shall discuss the successes and limitations of this project and discuss the relevance to theory and practice of organisational development.

### 5.2 Strengths

Øvretveit(2002) defined a quality programme as 'the planned activities carried out by an organisation or health system to improve quality.' The authors outlined 8 key factors to motivate and sustain implementation and to create conditions likely to produce results:

1. Senior management commitment
2. Sustained attention and the right time of management roles at different levels
3. A focus on customer need
4. Physician involvement
5. Sufficient resources
6. Careful programme management
7. Practical and relevant training which personal can use immediately
8. The right culture

This project was clinician led and focused on what IOTN5a patients need from our service. A carefully planned change process was implemented with appropriate training within a positive culture. It did not demand resources, but sustainability will rely on continued training and support within the unit and appropriate management “buy in” in addition to workforce planning to maintain capacity in the longer term. The compliance with the protocol was improved by feedback, continued education and reinforcement during mainstreaming.



**Figure 18: Patient journey for the new process. Young referrals will be in AssRv but other patients journeys should be streamlined.**

The SMART objective to develop and implement a Clinical Protocol was met and this was accepted by the clinical team.

Lillrank and Liukko (2004) described a 'quality broom' for reducing variation in clinical processes. Demand and capacity theory describes natural variation in patient factors such as age and malocclusion but that artificial variation is introduced by poor processes and poor management of the waiting list and the 'quality broom' sweeps the variation into alignment. Murray (2009) reported that reducing clinical variance with standardised protocols is central to improving processes. Figure 18 shows the new patient process, allowing for some natural variance, but reducing artificial variance. The DSA's and administrators become key enablers for the protocol as they were aware of the variation in clinical practice between different clinicians. We do not see each other work.

Understanding who and when to call patients allows service planning and resource allocation. The unit has now established a quality standard for providing treatment for IOTN5a patients. Even though 236 children are on the IOTN5a waiting list at the time of writing, 4 are waiting outside of our own gold standard the IOTN5a waiting list does not represent unmet clinical need. The indicative dates indicate that 79 IOTN5a patients should be allocated for treatment during 2016 to continue to meet the gold standard.

## **5.2 Impact on the Stakeholders**

Rechel (2010) suggested that we should view hospitals a highly complex processing plants rather than simple warehouses and that waiting lists were much more complex than counting numbers in and out. A clear understanding of demand and capacity allows process improvement to maximise available resources.

The presence of a queue is not always an indicator of a shortage of capacity (Allder 2010), but unintended delays or lack of alignment can lengthen waiting lists and backlogs can be hard to

clear. This project anticipated a backlog for IOTN5a patients due to temporary capacity issues and the potential impact for patients, the clinicians and the service. Remedial action and this patient-centred process change avoided a further backlog. One of our orthognathic IOTN5a patients started a blog during treatment and her 'Health Experience' was featured in the Irish Times. (Irish Times, 10<sup>th</sup> May, 2016) Her story very powerfully described how valuable the orthognathic service is and the positive aesthetic and functional benefits it delivers for patients with the most severe skeletal anomalies. It is not resourced to manage a backlog of patients who could benefit from other modes of treatment.

The HSE Service Plan 2015 says, "staff continue to be our most valuable resource" and "recruiting and retaining motivated and skilled staff in 2015 is our key objective". Key elements in staff engagement include mastery and initiative. (Leiter 2014) The consultant vacancy in the unit offered the opportunity for the clinical team to use their initiative to be proactive and manage the risk of the temporary capacity issues. Carsten and Uhl- Bien (2015) defined followership as the "beliefs, characteristics and behaviors that followers bring to the leadership relationship and how they affect leadership and organisational outcomes." Followers are no longer seen as the obedient mass but highly influential in establishing and positive and proactive work culture as seen in our unit in the absence of any obvious leader. Dinh (2015) describes this as bottom up leadership.

When HSE staff answered the 2014 staff survey, we reported much higher levels of satisfaction with our peers, immediate teams and line managers than with senior management and rated "leadership" poorly. This suggests that we collectively think about leadership as a top down phenomenon. Many types of leadership are needed at every level within the service. The HSE corporate plan 2015-17 states "evidence shows that happy motivated staff deliver better care and that their patients have better outcomes," highlighting the importance of staff engagement. Morey et al (2002) in the UK found that healthcare teams who worked well together were more effective and less stressed. Goffee and Jones (2006) outlined the benefits of non-hierarchical



leadership. This project shows the strengths of clinical 'followers' leading change to improve the service with process improvement. This aligned with the HSE strategic goals.

### 5.3 Limitations of the Project

Øvretveit (2003) highlighted that senior management support is key to the sustainability of change. The mainstreaming is on-going and the sustainability of the project relies on full support to achieve full compliance with the clinical protocol. Kotter (1995) identified that declaring wins too soon can limit the scope for change.

One 9-year-old attending for assessment had an overjet of 15mm and social issues associated with his malocclusion. He was prioritised for treatment due to the severity of his malocclusion. It was clear that it may still be appropriate to allocate some patients to treatment outside of the protocol in extreme cases.

Due to the long term nature of orthodontic treatment, measuring change in treatment outcome is not feasible in the short timescale of this study. Many of the patients who have been assessed under the new protocol will not be called to start treatment for up to 4 years, depending on their age at assessment and indicative date. The literature review outlined the best evidence on the timing of treatment, so although we can project that treatment outcome should improve with process change and well-timed treatment, this cannot be measured. Vig(1998) identified that the development of process and outcome measures in orthodontics lends itself to retrospective clinical studies and that prospective studies may be used to assess the quality of orthodontic treatment outcome and the duration and process of treatment.

Historically, patients were allocated evenly from both the IOTN 5 and 4 lists. In 2016, due to the remedial action and introduction of indicative dates, 80% of patients allocated to treatment were IOTN5, (5a and 5i patients identified to be prioritised and those waiting the longest.) We justified

this to avoid creating a backlog for IOTN5a treatment, which can be more timing critical than other malocclusions, but is not sustainable in the longer term. The IOTN4 waiting list is now nearly 4 years. In fact, because the National KPI measures length of time waiting, our unit metrics for this target will have got worse during this change process, despite the quality initiative for IOTN5a. De La Harpe (2008) identified “if we measure the wrong things the wrong way, then the wrong things get done.” The NTPF (2013) outlines that poor KPI’s can lead to poor understanding of the factors causing patient delays. This can lead to strategies to reduce waiting times that are not evidence based and therefore may be targeted at the wrong places. In orthodontics, a strategy was announced in 2015 to tender out IOTN4d patients who have been waiting more than 4 years. Although this will reduce the numbers waiting longest, they do not necessarily have the highest need. Outsourcing does not identify or address any of the system and process quality issues that are contributing to the waiting times or identify ways improve efficiency or capacity.

Our retiring colleague is leaving in June 2016, with 140 patients in active treatment plus patients in OBS and retention. That post had not been advertised at the time of writing despite a long planned for retirement. We can project from the data that if these patients had to be transferred to the existing clinicians, we will not meet our new gold standard for IOTN5a patients. New patient allocation would be delayed by 3 months to absorb the transfers and fewer new patients would start treatment this year.

Audits published from other units suggest they have different age profiles of children awaiting assessment and treatment and face challenges meeting the current KPI’s. (Meade,2013 Wolstencroft, 2013) The current National KPI’s do not measure age of patients. Resources may be required to manage any backlog prior to developing a national standard and KPI for IOTN5a.

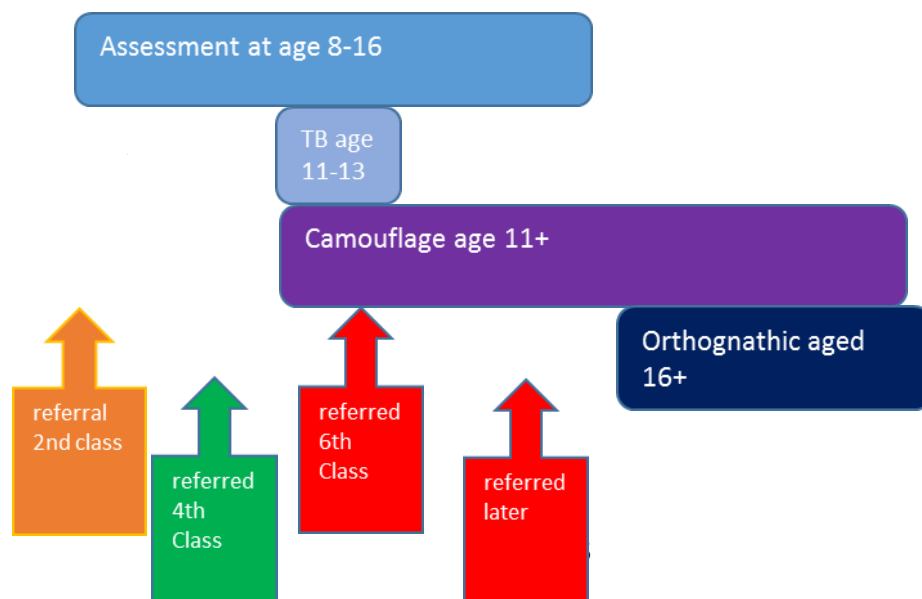
## 5.4 Recommendations

1. The NTPF (2013,p13) recommends outlines that services should be benchmarked nationally. The NHS Right Move published a map in 2011 showing the 'postcode lottery' for access for some NHS service. Dissemination of the IOTN5a protocol and KPI would support data driven discussion to improve equity in access to HSE orthodontic service nationally.

2.The IOTN5a protocol and KPI introduction of indicative dates has helped us to understand the unmet clinical need and urgency of IOTN5a patients waiting, but we do not have that knowledge for the other waiting lists. It was clear from the team meetings that there was also concern about IOTN5i and IOTN4c patients who should be prioritised, but also that there was a wide variation in how different clinicians viewed this and managed these patients. The unit would also benefit from development and implementation of protocols for interception for these malocclusions. It was also clear that a better understanding of where and why patients wait in the system the service would encourage further process improvement strategies to improve capacity and quality of care.

3.Orthodontics is not a stand-alone service so pressure in other services can negatively impact our service. "Oral Health Assessment" (HSE/UCC 2012) highlighted that the current practice for providing dental checks in 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> Class is removed from what the evidence suggests is best practice. The primary care service is under resourced, resulting in a strategy in our area to prioritise 2<sup>nd</sup> Class children. They are being referred for orthodontic assessment. Figure 18 shows the effect of this on the IOTN5a patient pathway. Most 2<sup>nd</sup> class children (amber) are too young for the treatment waiting list and will be held in AssRV. 4<sup>th</sup> Class is the ideal age for IOTN5a referral, but they will not be referred if they are not seen in primary care. Children referred from 6<sup>th</sup> Class or older who wait up to 6 months for assessment are likely be over 13 and past the 'window of opportunity' for the IOTN5a Protocol. Process improvement for the full

patient journey depends on access to primary care for children and investment in education on the timing of referral. (Scott, 2015)



**Figure 19: IOTN5a Clinical Protocol relies on timing of referral(green, amber, red)**

4.The main reasons for poor treatment outcome were poor compliance and attendance. Supporting patients to take responsibility for their oral health and attend a dentist is essential for quality orthodontic treatment and long term benefits. Clinicians should discharge non compliant patients to limit low value spending.

5.Schaufeli (2002) described work engagement as “a positive fulfilling work related state of mind that is characterised by vigor, dedication and absorption” and his research on positive organisational behaviour highlights the need for employees to have clear goals, a sustained workload, choice, control, recognition and social support. NTPF (2013,p13) outlines that clinicians should be benchmarked against each other with performance targets. Opportunities to celebrate success in the service in a climate of long waiting lists can improve engagement, whilst the lack of funding, pay scales or opportunities to progress within the service can lead to poor engagement. (Buchanan,2007) In 2006, McGuinness highlighted that many HSE specialist

orthodontists did not plan to stay and a number of have left the service since, some in areas of the highest need. Historically, many dentists preferred the autonomy of self-employment, but gender and generational studies suggest that women and Generation Y are more likely to want to work in organisations, but expect to work in organisations that develop them. (Lee,2013 Baker,2014 Thompson,2011) Strategies to support staff engagement,recruitment and retention in the HSE Orthodontic Service would benefit patients.

## 5.5 Summary

The HSE describes quality improvement as involving “every person, every process.”

This OD project successfully implemented a change process to improve quality, using the HSE Change Model. A clinical protocol was developed and implemented for IOTN5a patients and a performance measure was set. The experience of this change process and the associated reading highlighted the scope to continue to improve access, quality and to benefit the workforce and the service.

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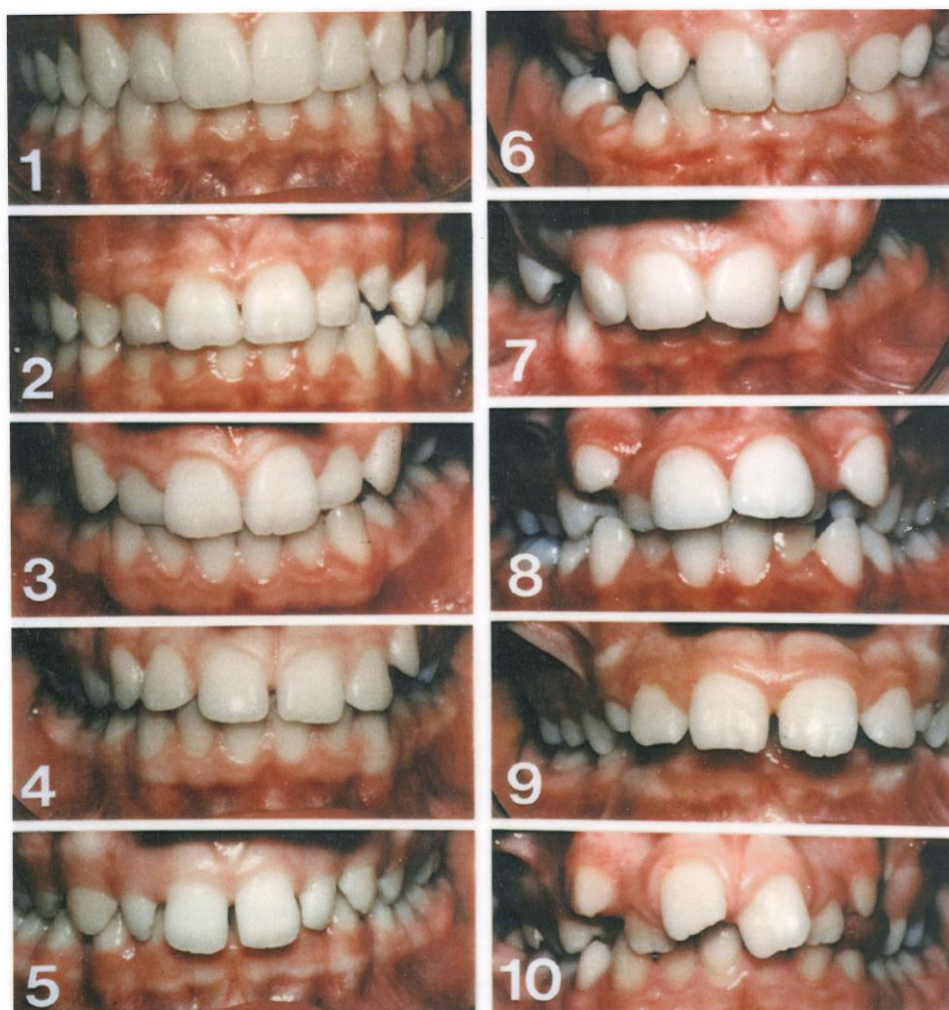
## Appendix 1: Index of Orthodontic Treatment Need (IOTN)

Brook and Shaw 1989

Grade	Characteristics
<b>5 (Very great)</b>	5.i Impeded eruption of teeth (with the exception of third molars) owing to crowding, displacement, the presence of supernumerary teeth, retained primary teeth and any pathological cause 5.h Extensive hypodontia with restorative implications (more than one tooth missing in any quadrant) requiring preresorative orthodontics 5.a Increased overjet >9 mm 5.m Reverse overjet >3.5 mm with reported masticatory and speech difficulties 5.p Defects of cleft lip and palate 5.s Submerged primary teeth
<b>4 (Great)</b>	4.h Less extensive hypodontia, requiring preresorative orthodontics or orthodontic space closure to obviate the need for a prosthesis 4.a Increased overjet >6 mm but ≤9 mm 4.b Reverse overjet >3.5 mm with no masticatory or speech difficulties 4.m Reverse overjet >1 mm but <3.5 mm, with recorded masticatory and speech difficulties 4.c Anterior or posterior crossbites with >2 mm discrepancy between retruded contact position and intercuspal position 4.l Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments 4.d Severe displacements of teeth >4 mm 4.e Extreme lateral or anterior open bites >4 mm 4.f Increased and complete overbite with gingival or palatal trauma 4.t Partially erupted teeth, tipped and impacted against adjacent teeth 4.x Supplemental teeth
<b>3 (Moderate)</b>	3.a Increased overjet >3.5 mm but ≤6 mm with incompetent lips 3.b Reverse overjet >1 mm but ≤3.5 mm 3.c Anterior or posterior crossbites with >1 mm but ≤2 mm discrepancy between retruded contact position and intercuspal position 3.d Displacement of teeth >2 mm but ≤4 mm 3.e Lateral or anterior open bite >2 mm but ≤4 mm 3.f Increased and complete overbite without gingival or palatal trauma
<b>2 (Little)</b>	2.a Increased overjet >3.5 mm but ≤6 mm with competent lips 2.b Reverse overjet >0 mm but ≤1 mm 2.c Anterior or posterior crossbite with ≤1 mm discrepancy between retruded contact position and intercuspal position 2.d Displacement of teeth >1 mm but ≤2 mm 2.e Anterior or posterior open bite >1 mm but ≤2 mm 2.f Increased overbite ≥3.5 mm without gingival contact 2.g Prenormal or postnormal occlusions with no other anomalies; includes up to half a unit discrepancy
<b>1 (None)</b>	Extremely minor malocclusions including displacements <1 mm

## Appendix 2: Aesthetic Component of treatment need.

Evans and Shaw 1987



*Victoria University of Manchester ©*

*The SCAN scale was first published in 1987 by the European Orthodontic Society (Ruth Evans and William Shaw, Preliminary evaluation of an illustrated scale for rating dental attractiveness, European Journal of Orthodontics 9: 314-318)*



### HSE ORTHODONTIC ELIGIBILITY GUIDELINES

#### Grade 5 Treatment required

- 5.a** Increased overjet > 9 mm
- 5.h** Extensive hypodontia (2 or more teeth missing in any quadrant excluding third molars) requiring pre-restorative orthodontics. Amelogenesis imperfecta and other dental anomalies which require pre-prosthetic orthodontic care. Incisors lost due to trauma assessed on a case by case basis
- 5.i** Impeded eruption of teeth (apart from 3rd molars) due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth, and any pathological cause
- 5.m** Reverse overjet > 3.5 mm with reported masticatory and speech difficulties
- 5.p** Defects of cleft lip and palate
- 5.s** Submerged deciduous teeth – arrange removal of teeth but orthodontic treatment not necessarily provided

#### Grade 4 Treatment required

- 4.b** Reverse overjet > 3.5 mm with no masticatory or speech difficulties
- 4.c** Anterior or posterior crossbites with > 2 mm discrepancy between the retruded contact position and intercuspal position
- 4.d** Severe displacements of anterior teeth > 4 mm but only with Aesthetic Component of 8 to 10 (see photographs below).
- 4.e** Extreme lateral or anterior open bites > 4 mm
- 4.f** Increased and complete overbite with gingival or palatal trauma
- 4.l** Posterior lingual crossbite with no functional occlusal contact in an entire buccal segment.
- 4.m** Reverse overjet > 1 mm but < 3.5 mm with recorded masticatory and speech difficulties

**Aesthetic Component 8 – 10 NB applies to 4d Category only**



Additional Eligibility Criteria – assessed on a case by case basis.

- Children who are in the care of the Health Service Executive and do not fall under any of the other eligibility criteria.
- Children with special needs who are referred by the primary dental care special needs service or a paediatric dental consultant.

2 July 2007

## Appendix 4: HSE Quality Improvement Division Mission 2015



## Appendix 5: Donabedian (1988) model for quality in Orthodontic Service

STRUCTURE	<ul style="list-style-type: none"> <li>○ Quality in staff; recruit those with the highest level of training and experience to deliver services.</li> <li>○ Quality of referring dental service to provide dental screening and identify eligible patients</li> <li>○ Quality in HR to retain the right candidates. Staff engagement and positive organisational culture lead to a more positive patient experience.</li> <li>○ Workforce planning, succession planning to recruit staff to allow service continuity.</li> <li>○ Provision of multi operator regional units is cost-effective whilst maintaining access to services</li> <li>○ Provision of materials and equipment to allow efficient work practices.</li> <li>○ Quality EMR with server and IT support</li> </ul>
PROCESS	<ul style="list-style-type: none"> <li>○ Quality in administrative systems for monitoring and managing patient records.</li> <li>○ Quality of referral- potential orthodontic problems are identified at the appropriate age and dental stage. Some orthodontic problems are easier to treat if they are identified in the developing dentition.</li> <li>○ Quality of assessment/access to the service- patients are seen in a timely manner to be assessed allowing timely intervention.</li> <li>○ Quality of service- patients taken off the waiting list and offered active treatment at a time when an ideal outcome can be achieved.</li> <li>○ Quality in timing of treatment and techniques to achieve best outcome using minimal appointment time and resources.</li> <li>○ Quality of operator; efficient and effective use of appointments to reduce treatment time and appointments</li> <li>○ Quality in patients: Patient engagement and motivation to encourage good attendance, compliance with treatment, dental health to reduce wasted appointments, reduce risk of adverse outcomes and achieve quality outcomes.</li> </ul>
OUTCOME	<ul style="list-style-type: none"> <li>○ Quality of outcome- indices such as PAR (Peer Assessment Rating) allow orthodontists measure occlusal treatment outcome. (Shaw &amp; Richmond)</li> <li>○ Quality of life studies and patient satisfaction surveys can measure patient factors in outcome. (Cunningham) and Net Promoters Score.</li> <li>○ Quality measures to evaluate unit activity, efficiency, outcome, treatments completed, treatment duration, poor compliance, patient turnover.</li> <li>○ Adverse outcomes such enamel decalcification can be audited.</li> </ul>

## Appendix 6:Stakeholder Analysis

importance↑↑

Patients and parents	Specialist orthodontists
National Oral Health Lead	Unit manager
Consultant Group	Waiting list coordinator
Principal Dental Surgeon	
Service manager	
Referring dentists	DSA's
Reception Staff	

influence→→

Benefit of process change by stakeholder:

Patient	Clinician	Unit manager
More equitable access to treatment. Reduced risk of trauma and increased self-esteem. Shorter, more efficient treatment.	More positive proactive culture improves staff engagement,  Supports clinicians to achieve more ideal outcomes and higher patient satisfaction.	Greater transparency should reduce no of calls for admin staff regarding timing of treatment Streamlined process allows better waiting list management and allocation of patients.
Referring dentist	Parent	Service Manager
More transparent process for delivery of treatment. Supports parent and patient education.	More transparency for parents Parents understand purpose of "wait" and feel child is cared for. Efficient treatment has less indirect cost for family.	Cost minimisation by reducing treatment duration/appliances Cost minimisation buy reducing pre-treatment visits. Coat-effective as reduces demand for OGS.

## Appendix 7: SWOT analysis for prioritising 5A patients by age.

Strengths	Weaknesses
<p>Evidence supports most ideal growth with maximal skeletal changes at age 11.5 (O'Brien)</p> <p>Evidence suggests best compliance before 12.5 (Banks, O'Brien)</p> <p>No benefit to starting treatment before age 11 (Cochrane Review) Evidence suggests early treatment is longer, more expensive.</p> <p>Starting treatment in 6<sup>th</sup> Class to reduce risk of trauma and social issues in secondary school.</p> <p>Later camouflage treatment may be a compromise for severe cases.</p> <p>Surgery accounts for the majority of the cost in orthognathic cases.</p>	<p>Variation in dental factors (severity of malocclusion, aetiology and patient factors (motivation, compliance, dental age and growth spurt) make it difficult to have one rule fits all.</p> <p>Variation in clinician preferences</p> <p>Cochrane review reports overall quality of evidence low for functional appliances</p> <p>Some children may get dental trauma while waiting</p> <p>Some patients with severe crowding or severe skeletal anomalies may still benefit from OGS as the treatment of choice.</p>
Opportunities	Threats
<p>Cost minimisation by offering well timed treatment, reducing treatment time and improving outcome.</p> <p>Improve reputation and staff engagement.</p> <p>Standardised protocol allows equity for all referrals and reduces clinical variation.</p> <p>Allows urgent patients to be identified and prioritised when capacity is not meeting demand.</p> <p>Protocol allows transparent evidence based pathway for referring dentists and parents to reduce early referrals.</p> <p>Reducing OGS demand, especially for single jaw BSSO surgery</p>	<p>Resistance to change from stakeholders.</p> <p>Long waiting lists can attract media attention, political lobbying and funding</p> <p>Loss of 4<sup>th</sup> class dental check in many areas means children often being referred too early (7-8) or too late (12+)</p> <p>Pressure from parent to start treatment if referred young-perception waiting long time.</p> <p>Pressure from KPI's to treat children waiting &gt;2years</p> <p>Resources need to be in place to meet demand</p>

## Appendix 8: Proposed protocol January 2016

1. referred 5A patients in 2<sup>nd</sup> Class (or children younger than 10)
  - cease any contributing habits asap
  - warn about risk of trauma and recommend use of gumshield for contact sports
  - review in Ass Rv at age 11 to reassess for eligibility and check dental development and growth.
  - Place potentially eligible patients into ASSRV, with date of recall the year and month the child turns 11.
  - Use clinical judgement to change date of recall to 10.0-11.5 depending on other orthodontic factors, growth/dental development)
  - advise that they are not on a treatment waiting list and that if eligible at reassessment, active treatment is likely to be in 6<sup>th</sup> Class.
2. referral of patients in 4<sup>th</sup>/6<sup>th</sup> Class age 10+ and ASS RV recalls
  - cease any contributing habits asap
  - warn about risk of trauma and recommend use of gumshield for contact sports
  - (a) Review in Ass RV if borderline and habits are contributing to overjet.
  - (b) Place eligible patients on 5A WL STATUS 5A, with date of recall the year and month the child turns 12 or by December of 6<sup>th</sup> Class.
  - (c) use clinical judgement to change date of recall to year and month patient turns age 11.5-12.5 depending on dental stage, growth and school class)
  - (d) if a child is likely to be surgical only or not suitable for a functional, please make this clear on the orthotrac recall.
  - (e) if there is a clinical/social reason to call any child younger than 11.5 or later than 12.5 (eg growth or dental development) please make this clear on the orthotrac recall

### AIMS of protocol:

1. to achieve the best clinical outcome at minimum cost for 5A patients
2. to avoid taking children under age 11 into active treatment, even if they have been referred very young.
3. to offer eligible 5A patients a functional appliance in 6<sup>th</sup> Class, to reduce social/self esteem issues and risk of trauma before they go to secondary school and start to play more aggressive contact sports.
4. to provide functional appliances to eligible patients who may benefit from them, reduce the potential orthognathic costs later or patients who don't wish to proceed with OGS accepting compromise/camouflage outcomes.
5. to set a measure (KPI) within the department to evaluate compliance with this.

## Appendix 9: IOTN5a Clinical Protocol April 2016

### Referred 5A patients in 2<sup>nd</sup> Class (or children younger than 10)

- cease any contributing habits asap & warn about risk of trauma; recommend use of gumshield for contact sports
- **REVIEW** potentially eligible patients in **Assessment Review** at age 11 to reassess for eligibility and check dental development and growth.
- Change STATUS to ASS RV
- SCHEDULE RECALL to year and month the child turns 11.
- TYPE is RV, COMMENT is 5A
- Use clinical judgement to change date of recall to 10.0-11.5 depending on other orthodontic factors, growth/dental development)
- Advise that they are not on a treatment waiting list and that if eligible at reassessment, active treatment is likely to be in 6<sup>th</sup> Class.

0  
1  
initiated by patient.

5w 29 30 31 Jun 1 2 3 4  
6w 5 6 7 8 9 10 11

Zoom

**Schedule Recall**

☐ 3 Months ☐ 6 Months ☐ 12 Months ☒ Other

☐ Alpha 08/2018 Type A/R

Comment 5A

8 yrs 8 mos F

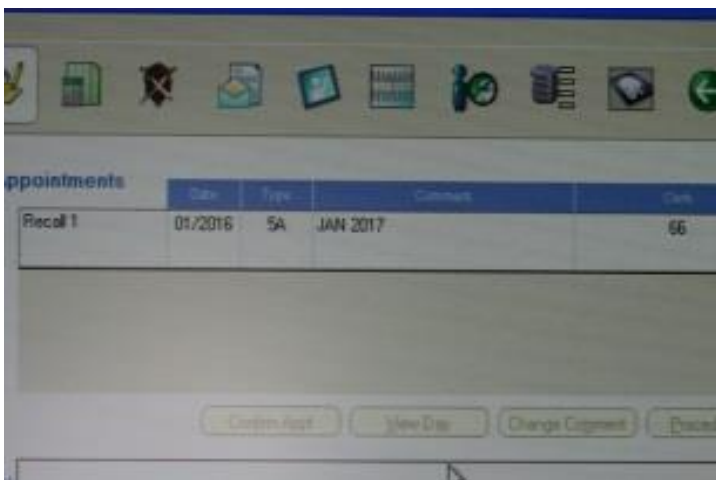
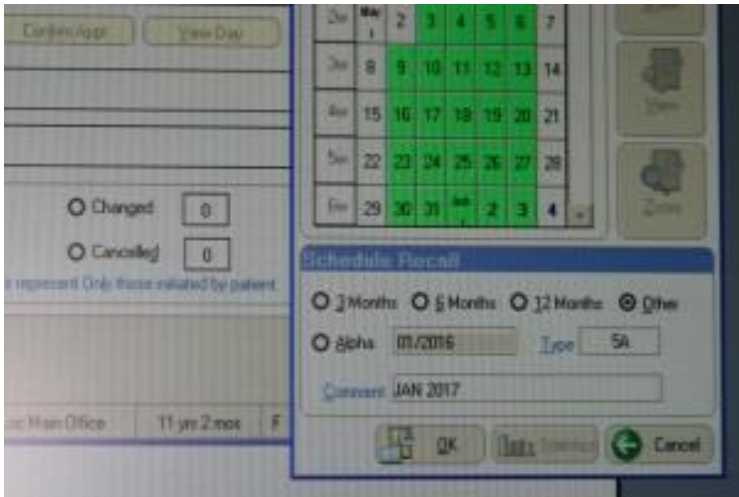
OK Statistics Cancel

	Date	Type	C
Recall 1	08/2018	A/R	5A



## Referred 5A patients in 4<sup>th</sup>/6<sup>th</sup> Class age 10+ and ASS RV recalls

- cease any contributing habits & warn about risk of trauma and recommend use of gumshield for contact sports
- REVIEW in ASS RV if borderline and habits are contributing to overjet(as above)
- Change STATUS of **Eligible** patients to 5A
- SCHEDULE RECALL to year and month the child is PUT ON THE WAITING LIST.
- TYPE is 5A.
- COMMENT is a TCI Date (to come in) for when the child should start treatment. (Month/Year the child turns 12 or by Jan of 6<sup>th</sup> Class)
- Use clinical judgement to change date of recall to year and month patient turns age 11.5-12.5 depending on dental stage, growth and school class)



- If a child is likely to be surgical only or not suitable for a functional, please make this clear on the orthotrac recall comment.
- If there is a clinical/social reason to call any child younger than 11.5 or later than 12.5 (eg growth or dental development) please make this clear on the orthotrac recall comment.



### **AIMS of protocol:**

- To allow patients to be allocated in an equitable order by Susan. #
- To make sure assessment outcome is recorded in a consistent way.
- To avoid clinicians rechecking charts or changing status after assessment.
- To avoid taking children under age 11 into active treatment, even if they have been referred very young.
- To offer eligible 5A patients a functional appliance in 6<sup>th</sup> Class, to reduce social/self esteem issues and risk of trauma before they go to secondary school and start to play more aggressive contact sports.
- To reduce the future service demands for orthognathic surgery.
- To achieve the best clinical outcome for 5A patients.
  - a. Patients on the 5A WL now have a TCI date for 2016 or 2017
  - b. If patients are put on the 5A WL WITHOUT A DATE they may be at a disadvantage.
  - c. If patients are put on the 5A WL outside of the criteria, they may be leapfrogging other eligible patients.
  - d. To monitor the patients in AssRv they also needed to have the comment 5A in the recall, so we can track the younger patients coming up through the system.

### **Process Measures:**

This allows us to continue to measure the gold standard and we discussed that this should be:

100% of patients put on the 5A WL are allocated a TCI date at assessment to indicate when they should be called for treatment.

If they are too young for a TCI date, they are reviewed for a reassessment in Assessment Review, with the date to be recalled and comment 5A

### **Outcome Measure: KPI**

80% of 5A patients have an appointment to start treatment within 3 months of TCI date.

## Appendix 10

## Glossary of Abbreviations and Orthodontic Terms:

- |             |   |
|-------------|---|
| 1. DCYA     | Department of Children and Young Adults                 |
| 2. DNA      | Did Not Attend appointment                              |
| 3. DOH      | Department of Health                                    |
| 4. DOHC     | Department of Health and Children                       |
| 5. DSA      | Dental Surgery Assistant                                |
| 6. EMR      | Electronic Medical Record                               |
| 7. HIQA     | Health Information and Quality Assurance                |
| 8. HSE      | Health Service Executive                                |
| 9. IOTN     | Index of Orthodontic Treatment Need                     |
| 10. IOTN 5a | Defines a malocclusion with an overjet greater than 9mm |
| 11. KPI     | Key Performance Indicators                              |
| 12. NCEC    | National Clinical Excellence Committee                  |
| 13. NTPF    | National Treatment Purchase Fund                        |
| 14. PAR     | Peer assessment rating for assessing treatment changes  |
| 15. PCRC    | Primary Care Research Committee                         |
| 16. OGS     | Orthognathic Surgery                                    |
| 17. SDU     | Special Delivery Unit                                   |
| 18. TB      | Twin-Block functional appliance                         |
| 19. URA     | Upper Removable Appliance                               |

## Glossary of Orthodontic Terms:

1. **Aesthetic Component** This is a 10 grade scale of dental images ranging from a very pleasing (1) to very displeasing appearance (10)
2. **Appliance** A fixed or removable device which the orthodontist uses to change the position of teeth or jaws
3. **Arch** The ensemble of teeth in either jaw in a horseshoe shape
4. **Caries** Dental decay resulting from the action of bacteria on sugary foods Cast A study model, in plaster or in stone, of the teeth and dental arch
5. **Cephalometrics** Measurements of the how teeth and jaws are aligned and growing using a lateral skull x-ray
6. **Class I malocclusion** The teeth are mis-aligned and irregular but meet correctly

7. **Class II malocclusion** The upper jaw and teeth protrude relative to the lower jaw and teeth, the teeth may also be irregular
8. **Crowding** A malocclusion caused by insufficient space for the teeth
9. **Dental Health** The overall health of the mouth, teeth, gums and supporting tissues
10. **Eruption** Emergence of the tooth through the gums
11. **Fixed appliance** Any orthodontic component that is cemented or bonded to the teeth, it is extremely accurate at moving teeth and needs careful adjustment and monitoring
12. **Functional Appliance** A special removable appliance which changes the way the teeth and jaws bite together
13. **Impacted tooth** A tooth that is embedded in the jaw and is prevented from erupting normally
14. **Interceptive** Treatment carried out at an early age to allow the more definitive treatment to be more easily completed at a later stage.
15. **Malocclusion** Abnormal occlusion of the teeth or jaws
16. **Mandible** The lower jaw
17. **Maxilla** The upper jaw
18. **Occlusion** The meeting together of the upper and lower teeth and jaws
19. **Orthodontic Therapist** Health care professional who works with orthodontist – responsible for changing archwires, taking records, etc. Carries out clinical procedures under the supervision of an orthodontist.
20. **Orthognathic Surgery (OGS)** Correction of the jaws by means of an operation, usually combined with orthodontic straightening of the teeth
21. **Overbite** The vertical overlap of the upper over the lower teeth
22. **Overjet (OJ)** The horizontal overlap of the upper teeth over the lower teeth
23. **Permanent teeth** The secondary or adult teeth, there are 16 in each arch
24. **Retainer** A fixed or removable appliance for maintaining the positions of the teeth and jaws after orthodontic treatment
25. **Specialist Orthodontist** A dentist who has special qualifications and training in orthodontics
26. **Treatment Plan** An outline of the clinical steps which are to be followed to correct the malocclusion

