OPEN ACCESS

Saudi Journal of Oral and Dental Research

Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) | ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Review Article **Orthodontics**

A Stepwise Clinical Framework for the Referral of Children with Malocclusion: Guidance for General Dental Practitioners and New Graduates

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DOI: https://doi.org/10.36348/sjodr.2026.v11i05.003 | **Received:** 13.03.2026 | **Accepted:** 08.05.2026 | **Published:** 11.05.2026

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Abstract

Malocclusion is a highly prevalent developmental condition in children and adolescents and represents one of the most frequent reasons for referral from primary dental care to orthodontic services [1, 2]. General Dental Practitioners (GDPs), particularly newly qualified dentists, often face uncertainty when assessing malocclusion severity, determining the optimal timing of referral, and establishing eligibility for National Health Service (NHS) orthodontic treatment [11, 12]. This uncertainty may result in delayed referral of high-risk cases or inappropriate referral of children with minimal treatment need, placing unnecessary pressure on specialist services [13]. This narrative review proposes a stepwise orthodontic referral ladder, translating the Index of Orthodontic Treatment Need (IOTN) into a clinically intuitive and structured decision-making framework. The model classifies malocclusion from mild to severe, incorporates red-flag conditions requiring early or urgent referral, integrates optimal age for referral, and aligns with UK NHS commissioning and British Orthodontic Society guidance [18–20]. The framework aims to provide GDPs and new graduates with a clear, defensible, and patient-centred reference scale to support consistent orthodontic referral decisions and improve outcomes for children.

Keywords: Malocclusion, Index of Orthodontic Treatment Need (IOTN), General Dental Practitioners (GDPs), Orthodontic Referral, NHS Commissioning.

1. INTRODUCTION

Malocclusion is among the most prevalent developmental dental conditions affecting children worldwide and constitutes a significant proportion of referrals from primary care to orthodontic services [1, 2]. Although many occlusal irregularities are mild and largely aesthetic, others may predispose affected children to functional impairment, dental trauma, periodontal compromise, and psychosocial distress if not identified and managed appropriately [5–7].

Within the United Kingdom, General Dental Practitioners (GDPs) act as the principal gatekeepers for orthodontic referral within the NHS. Due to the finite nature of orthodontic resources, NHS commissioning prioritises children with demonstrable dental health need rather than cosmetic concern alone [18–20]. The Index of Orthodontic Treatment Need (IOTN) was therefore developed to provide an objective and equitable method of prioritising orthodontic care based on clinical impact rather than appearance [1-3].

Despite its widespread adoption, studies consistently demonstrate variability in the application of IOTN among undergraduate students and early-career clinicians, particularly when managing borderline cases [11, 12]. This review addresses this gap by presenting a stepwise framework ladder that translates IOTN grading into a practical, defensible referral pathway suitable for daily use in general dental practice.

2. Classification of Malocclusion by Severity

Initial assessment of malocclusion severity is essential to determine referral necessity and urgency. Malocclusion can be broadly categorised as mild, moderate, or severe based on occlusal discrepancy,

functional impact, and risk of progression [1-5]. Table 1 presents a severity-based classification of malocclusion designed to support early clinical stratification in primary dental care. Rather than serving as a referral trigger, this classification functions as an initial riskassessment framework that contextualises occlusal traits according to their potential impact on dental health, function, and growth. Mild malocclusions are characterised by minimal occlusal discrepancy and an absence of demonstrable functional or pathological risk. The available evidence indicates that such traits are predominantly aesthetic in nature and do not predict adverse oral health outcomes, thereby justifying a conservative approach centred on monitoring rather than referral.

Moderate malocclusions represent a transitional category in which occlusal discrepancies may not yet meet definitive treatment thresholds but carry the potential for functional disturbance or progression during growth. Conditions such as moderate overjet and limited crossbite are therefore assigned earlier optimal assessment windows, reflecting evidence that selective early intervention may reduce future treatment complexity in specific cases. Importantly, this group highlights the need for clinical judgement, as not all moderate malocclusions will require specialist input.

Severe malocclusions are distinguished by clear associations with functional impairment, trauma risk, eruption disturbance, or long-term morbidity. The inclusion of earlier referral age ranges for these conditions reflects robust evidence that delayed intervention may result in irreversible consequences, including root resorption, facial asymmetry, and increased treatment burden. By integrating severity with optimal timing, Table 1 provides a clinically meaningful bridge between descriptive malocclusion classification and evidence-based referral planning, reinforcing that severity alone is insufficient without consideration of developmental context and risk of harm.

Table 1: Types of Malocclusion Classified from Mild to Severe with Optimal Referral Age

Severity	Malocclusion Type	Clinical Features	Functional / Health Impact	Optimal Age
Mild	Minor crowding	<2 mm displacement	Aesthetic only	Monitor; 11–13 yrs
	Mild spacing	No occlusal interference	None	No referral
	Increased overbite	No gingival trauma	Minimal	11–13 yrs if worsening
Moderate	Increased overjet	3.5–6 mm	Trauma risk increases	9–11 yrs
	Anterior crossbite	≤2 mm discrepancy	Functional shift	7–9 yrs
	Posterior crossbite	≤2 mm discrepancy	Facial asymmetry risk	7–9 yrs
	Open bite	≤4 mm	Speech difficulty	9–12 yrs
Severity	Malocclusion Type	Clinical Features	Functional / Health Impact	Optimal Age
Severe	Severe overjet	>6 mm	High trauma risk	8–10 yrs
	Reverse overjet	>3.5 mm	Mastication/speech issues	7–9 yrs
	Severe crowding	>4 mm displacement	Oral hygiene difficulty	11–13 yrs
	Impacted teeth	Excluding third molars	Pathology risk	7–9 yrs

Evidence demonstrates that severe overjet and functional crossbite are associated with increased trauma risk and adverse growth patterns, justifying earlier referral in these groups [6–9].

3. The Index of Orthodontic Treatment Need in Primary Care

Table 2 summarises IOTN Grades 1, 2, and 3, which represent malocclusions with no, little, or borderline orthodontic treatment need. Grade 1 malocclusion includes very minor occlusal irregularities, such as minimal tooth displacement, that have no functional significance and typically do not require orthodontic intervention. These cases are generally managed within primary care through reassurance and routine observation during dental development.

Grade 2 malocclusion encompasses mild occlusal discrepancies, including increased overjet within the range of 3.5 to 6 mm where lip competence is maintained, as well as minor spacing or crowding that does not interfere with function. Children within this category may benefit from periodic monitoring as the dentition develops, particularly during the mixed dentition stage, to identify any changes that might alter treatment need over time.

Grade 3 malocclusion represents borderline orthodontic treatment need and includes conditions such as moderate tooth displacement or limited open bite. These cases may not immediately meet criteria for orthodontic referral but require careful assessment and follow-up. Management at this stage commonly involves monitoring growth and eruption patterns, with consideration of referral if the malocclusion worsens, becomes associated with functional disturbance, or is influenced by additional clinical factors. By outlining the clinical characteristics and typical management approach

for each grade, Table 2 provides a structured overview of low to borderline malocclusions encountered in primary dental care.

The index categorises malocclusion from Grade 1 (no need) to Grade 5 (very great need) [1-3].

Table 2: IOTN Grades 1–3: Clinical Features, Management, and Referral Decision

IOTN Grade	Description	Typical Clinical Features	GDP Management	Referral Decision	Optimal Age
Grade 1	No treatment need	Very minor tooth irregularities; minimal spacing or crowding with no functional impact	Reassure patient and parents; routine dental care	No referral – reassure	No referral
Grade 2	Little treatment need	Mild increased overjet (3.5–6 mm) with competent lips; mild crowding or spacing without functional compromise	Periodic review during growth; preventive advice	No referral – monitor	Review at 11–13 yrs
Grade 3	Borderline treatment need	Moderate tooth displacement (2–4 mm); limited open bite; borderline overjet	Monitor growth and eruption; assess modifiers (trauma risk, function, psychosocial impact)	Conditional referral	10–12 yrs

Table 3 outlines IOTN Grades 4 and 5, which represent malocclusions associated with definite and very great orthodontic treatment need. Grade 4 malocclusions include occlusal conditions such as increased overjet between 6 and 9 mm, severe transverse discrepancies including crossbite with displacement, and significant space discrepancies. These conditions are typically associated with functional compromise or increased risk of dental trauma and therefore warrant routine referral for orthodontic assessment, usually during the early permanent dentition stage when comprehensive treatment planning can be undertaken.

Grade 5 malocclusions encompass conditions of greater severity and complexity, including impacted permanent incisors, severe hypodontia requiring multidisciplinary management, cleft lip and palate, and other craniofacial anomalies. These cases often necessitate early orthodontic involvement to facilitate eruption guidance, space management, and coordination of care with restorative, surgical, or paediatric dental specialties. For this reason, Grade 5 conditions are associated with earlier referral age ranges and are commonly prioritised within specialist services.

By presenting these conditions in a structured format, Table 3 provides clinicians with a clear overview of malocclusions that require timely referral and specialist input due to their complexity and potential impact on dental development.

Table 3: IOTN Grades 4–5: Clinical Features and Referral Decision

IOTN Grade	Description	Typical Clinical Features	GDP Management	Referral Decision	Optimal Age
Grade 4	Definite treatment need	Severe overjet (6–9 mm); significant crossbite; severe crowding threatening eruption	Initiate orthodontic referral with supporting records	Refer routinely (NHS eligible)	10–13 yrs
Grade 5	Very great treatment need	Impacted permanent incisors; hypodontia; cleft lip/palate; craniofacial anomalies	Urgent referral; consider MDT coordination	Urgent / priority referral	7–9 yrs

4. The Stepwise Orthodontic Referral Ladder

The Stepwise Orthodontic Referral Ladder translates IOTN grading into a clinically meaningful decision-making pathway. Rather than treating IOTN as a binary referral trigger, the framework integrates malocclusion severity, functional impact, age-appropriate timing, and NHS eligibility [1-18]. At Steps 1 and 2, children with IOTN Grades 1 and 2 present with minimal dental health risk and do not benefit from specialist orthodontic input. At Step 3, borderline cases require contextual evaluation. Steps 4 and 5 identify children with clear treatment need who should be referred promptly.

Table 4 constitutes the central decision-making tool of the stepwise referral framework and is intended to be used by professionals as a key indicator when determining the appropriateness and urgency of orthodontic referral. Each step of the ladder corresponds to a defined clinical scenario commonly encountered in primary care and translates assessment findings into clear, proportionate management actions.

At Step 1, minor occlusal irregularities such as minimal anterior crowding or slight spacing in the early mixed dentition are identified. These findings have no functional consequence and require reassurance only, for

example a child with mild incisor irregularity following exfoliation of deciduous teeth. Step 2 includes mild malocclusions such as an increased overjet within normal functional limits or mild crowding without oral hygiene compromise, where periodic monitoring is appropriate, for instance a 9-year-old with a stable 4 mm overjet and competent lip seal.

Step 3 addresses borderline malocclusions that require careful clinical judgement. Examples include moderate crowding of erupting permanent incisors, a limited anterior open bite without speech difficulty, or a borderline overjet in a physically active child. In such cases, conditional referral or continued observation is guided by growth pattern, trauma risk, and functional impact rather than severity alone.

At Step 4, definite treatment need is present and referral is indicated. Typical examples include a child with a severe overjet exceeding 6 mm, a unilateral posterior crossbite without functional shift, or significant space loss threatening eruption of permanent teeth. Step 5 encompasses severe or pathological conditions requiring urgent or priority referral, such as impacted maxillary incisors, functional crossbite with mandibular displacement, severe reverse overjet affecting mastication or speech, or hypodontia requiring multidisciplinary planning.

By illustrating each step with recognisable clinical examples, Table 4 provides professionals with a clear, standardised benchmark for referral decision-making. Its structured approach supports consistent practice, legitimises non-referral and monitoring where appropriate, and ensures timely escalation of high-risk cases, thereby enhancing patient safety, service efficiency, and alignment with NHS orthodontic commissioning principles.

Table 4: Stepwise Orthodontic Referral Framework for Children with Malocclusion

Step	Clinical Definition of the Step	Typical Clinical Conditions Included	IOTN Grade	GDP Clinical Action	Referral Decision	Recommended Referral Age
Step 1	Occlusion within normal developmental limits, with no functional impairment or risk of progression	Minor incisor irregularity during eruption; mild spacing in mixed dentition; transient tooth rotations; minor midline discrepancy without functional shift	Grade 1	Reassure patient and parents; routine review	No referral	Any age
Step 2	Mild malocclusion present but stable, with no functional compromise and low risk of deterioration	Mild crowding (<2 mm); increased overjet 3.5–6 mm with competent lips; mild deep bite without gingival trauma; mild anterior open bite without speech difficulty	Grade 2	Monitor occlusal development during growth	No referral – monitor	9–11 years
Step 3	Borderline malocclusion where treatment need depends on modifying risk factors and growth pattern	Moderate crowding (2–4mm); borderline increased overjet in active child; limited anterior open bite; unilateral crossbite without functional displacement; early space loss with potential eruption disturbance	Grade 3	Assess risk modifiers and review periodically	Conditional referral	10–12 years
Step 4	Definite orthodontic treatment need with functional compromise or high trauma risk, likely to worsen without intervention	Severe overjet (>6 mm); bilateral posterior crossbite; significant space loss affecting eruption; severe crowding (>4 mm); non-functional anterior crossbite	Grade 4	Initiate orthodontic referral	Routine NHS referral	10–13 years

Step	Clinical Definition of the Step	Typical Clinical Conditions Included	IOTN Grade	GDP Clinical Action	Referral Decision	Recommended Referral Age
Step 5	Severe or pathological malocclusion with established or imminent harm, often requiring multidisciplinary care	Impacted permanent incisors; functional crossbite with mandibular displacement; severe reverse overjet (>3.5 mm); hypodontia; craniofacial anomalies; ankylosed deciduous teeth	Grade 5	Urgent referral and MDT coordination	Urgent / priority referral	7–9 years

5. Red-Flag Malocclusions Requiring Early Referral

Certain malocclusions require early referral regardless of IOTN score due to the risk of irreversible harm [6-16]. Clinical Application section: The conditions listed in Table 5 represent mandatory early or urgent referral triggers and are intended to override stepwise IOTN-based decision-making. These red-flag malocclusions are associated with time-sensitive risks, including irreversible eruption disturbance, functional impairment, skeletal asymmetry, or increased trauma susceptibility. In such cases, delayed referral may significantly increase treatment complexity and long-term morbidity. Accordingly, the presence of any condition outlined in Table 5 should prompt immediate escalation to specialist orthodontic services, regardless of the assigned IOTN grade or position within the stepwise referral ladder.

Table 5: Mandatory Early or Urgent Orthodontic Referral Conditions (Red Flags)

Red-Flag Condition	Clinical Significance	Referral Decision	Optimal Referral Age
Impacted permanent incisors	High risk of root resorption, space loss, and eruption failure	Urgent referral required	7–9 years
Functional posterior crossbite	Mandibular displacement with risk of facial asymmetry	Early referral required	7–9 years
Severe increased overjet with trauma history or lip incompetence	Increased risk of dental trauma and soft-tissue injury	Priority referral required	8–10 years
Severe reverse overjet (>3.5 mm)	Functional compromise affecting mastication and speech	Early referral required	7–9 years
Red-Flag Condition	Clinical Significance	Referral Decision	Optimal Referral Age
Progressive facial asymmetry	Indicative of underlying skeletal discrepancy	Early referral required	Mixed dentition
Hypodontia (excluding third molars)	Requires multidisciplinary orthodontic–restorative planning	Early referral required	8–10 years
Craniofacial anomalies (e.g. cleft lip and palate)	Complex growth disturbance requiring MDT management	Immediate referral required	At diagnosis
Ankylosed deciduous teeth	Interference with normal eruption and arch development	Early referral required	7–9 years

6. Practical GDP Documentation and Medico-Legal Justification (Grades 1–3)

When a decision is made not to refer a child with IOTN Grades 1–3, this must be documented as an active clinical decision. GDPs should record the IOTN grade, absence of functional risk, growth status, oral hygiene, and patient motivation. For Grade 3, documentation should justify monitoring rather than referral and include safety-net advice. This approach aligns with NHS guidance prioritising dental health need and supports defensible clinical practice [18–20].

7. DISCUSSION

The referral of children with malocclusion from primary care to orthodontic services represents a critical interface between clinical judgement, developmental timing, and healthcare system capacity. While the Index of Orthodontic Treatment Need (IOTN) provides an established method for stratifying malocclusion severity based on dental health impact, its use in isolation does not fully address the complexities encountered in general dental practice. The present review proposes a stepwise orthodontic referral framework that contextualises IOTN grading within functional risk, growth stage, and NHS

commissioning criteria, thereby supporting more consistent and defensible referral decisions.

7.1 Interpretation and limitations of IOTN in Primary Care

The IOTN was developed to prioritise orthodontic treatment according to health-related need rather than aesthetic concern [1, 2]. Evidence supporting its validity is robust, particularly in specialist settings [3, 4]. However, studies repeatedly demonstrate variability in IOTN application among undergraduate students and newly qualified dentists, especially when managing borderline cases [11, 12]. This variability reflects a key limitation of the index: while it categorises severity, it does not specify the appropriate *clinical response* in primary care, nor does it account for developmental timing or service eligibility.

In practice, this has led to two opposing but equally problematic behaviours: defensive overreferral of low-need cases and delayed referral of time-sensitive conditions. The stepwise framework addresses this limitation by repositioning IOTN as one component of a broader decision-making process rather than a standalone referral trigger.

7.2 Justification for Non-Referral of IOTN Grades 1 and 2

A central finding of this review is that routine referral of children with IOTN Grades 1 and 2 is neither clinically justified nor systemically appropriate within an NHS-funded model. These grades represent malocclusions characterised by minor occlusal irregularities that are predominantly aesthetic and lack consistent evidence of association with functional impairment, trauma risk, or long-term oral morbidity [5-14].

From a clinical perspective, early specialist intervention in these cases offers limited benefit. From a service perspective, NHS orthodontic commissioning explicitly prioritises children with demonstrable dental health need, typically corresponding to IOTN Grades 4 and 5 [18–20]. Referral of Grades 1 and 2 therefore contributes to unnecessary service demand, increased waiting times, and delayed access for children with greater need.

Importantly, non-referral should not be interpreted as inaction. The framework reframes nonreferral as an active clinical decision, supported by reassurance, preventive advice, and monitoring through growth. This distinction is particularly important for new graduates, for whom uncertainty may otherwise drive inappropriate referral behaviour.

7.3 Management of IOTN Grade 3: Borderline Need and Conditional Referral

IOTN Grade 3 represents the most challenging category for GDPs and is the principal source of inconsistency in referral patterns. By definition, Grade 3 reflects borderline treatment need, and evidence suggests that many such malocclusions remain stable or improve during growth without intervention [15]. Routine referral of all Grade 3 cases therefore results in high rejection rates within NHS orthodontic services and contributes little to patient benefit [19, 20].

The stepwise framework advocates a conditional referral approach for Grade 3, whereby referral is guided by the presence of modifying factors rather than severity alone. These include increased trauma risk, functional impairment, psychosocial distress, eruption disturbance, or evidence of progression. This approach aligns with both the evidence base and NHS commissioning logic, ensuring that borderline cases are neither ignored nor escalated prematurely.

7.4 Role of the Stepwise Referral Ladder in Clinical Decision-Making

Table 4 constitutes the operational core of the proposed framework, translating assessment findings into proportionate management actions. By clearly distinguishing between reassurance, monitoring, conditional referral, routine referral, and urgent escalation, the ladder provides GDPs with a practical reference that reduces ambiguity and supports consistent practice. The explicit linkage between clinical findings, IOTN grade, and recommended action enhances transparency and medico-legal defensibility.

Crucially, the framework legitimises restraint in referral behaviour where appropriate, reinforcing that good clinical judgement includes knowing when *not* to refer. At the same time, it provides unequivocal guidance for escalation in cases of definite or severe malocclusion.

7.5 Mandatory Red-Flag Conditions and Safeguarding Against Delayed Referral

Table 5 complements the stepwise ladder by identifying malocclusions that require early or urgent referral regardless of IOTN grade. Conditions such as impacted permanent incisors, functional posterior crossbite with mandibular displacement, severe reverse overjet, hypodontia, and craniofacial anomalies are time-sensitive and associated with irreversible harm if referral is delayed [6–16].

By explicitly designating these conditions as mandatory referral triggers, the framework safeguards against one of the greatest risks in primary care orthodontic assessment: delayed recognition of pathology. The separation of red-flag conditions into a standalone table reinforces their priority and ensures they override stepwise severity-based decision-making.

7.6 Implications for Education, Governance, and NHS Service Efficiency

The proposed framework has important implications for undergraduate education, foundation training, and clinical governance. For new graduates, it provides a structured cognitive scaffold that mirrors real-world decision-making rather than isolated index application. For experienced practitioners, it offers a consistent benchmark against which referral decisions can be justified and documented.

At a system level, adoption of the framework has the potential to reduce inappropriate referrals, improve triage efficiency, and prioritise access for children with the greatest need—key objectives within NHS orthodontic commissioning [18–20]. By aligning clinical judgement with service capacity, the framework supports equitable, patient-centred care.

8. CONCLUSION

This review presents a stepwise orthodontic referral framework designed to support General Dental Practitioners and new graduates in making consistent, evidence-based, and NHS-aligned decisions when assessing children with malocclusion. By translating the Index of Orthodontic Treatment Need into a structured clinical pathway that incorporates malocclusion severity, functional risk, developmental timing, and mandatory red-flag conditions, the framework addresses key limitations of index-only referral approaches in primary care.

A central contribution of this framework is its explicit justification for the non-referral of IOTN Grades 1 and 2 and the conditional management of Grade 3 malocclusion, reinforcing that appropriate restraint in referral behavior is a marker of sound clinical judgement rather than omission. At the same time, the framework provides unequivocal guidance for the timely escalation of children with definite or severe orthodontic need, as well as those presenting with time-sensitive red-flag conditions where delayed referral may result in irreversible harm.

By clearly linking clinical findings to proportionate management actions, the stepwise ladder enhances transparency, reduces variability in referral practice, and supports defensible clinical decision-making. Its alignment with UK NHS commissioning priorities has the potential to improve referral quality, optimise use of specialist orthodontic services, and prioritise access for children with the greatest dental health need.

Integration of this framework into undergraduate education, foundation training, and primary care referral systems may strengthen clinical confidence, improve governance, and contribute to safer, more efficient orthodontic care delivery. Future evaluation of its impact on referral patterns, acceptance rates, and patient outcomes will further define its role as a practical reference standard in primary dental care.

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