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**A GENERIC FRAMEWORK FOR IMPLEMENTING SELF-LIGATING BRACES
 ORTHODONTIC TREATMENT AT NALA HUSADA DENTAL HOSPITAL**

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ABSTRACT

Background: The demand for orthodontic treatment continues to increase globally, driven by greater awareness of dental aesthetics and oral health-related quality of life. Dental hospitals must develop structured service systems integrating clinical innovation with effective healthcare management. Self-ligating bracket systems represent a contemporary orthodontic technology designed to improve treatment efficiency, reduce chairside time, and enhance patient comfort compared with conventional systems. **Purpose:** This study developed a generic implementation framework for self-ligating orthodontic treatment services in dental hospitals, using Nala Husada Dental Hospital, Surabaya, Indonesia as a case model. **Methods:** A descriptive implementation framework approach was used to analyze orthodontic service development. Framework development involved four stages: pre-implementation analysis, clinical workflow design, integration of orthodontic innovation, and post-implementation monitoring. The model integrated healthcare service management components: input, process, output, outcome, and continuous improvement. Service performance indicators included patient visits, treatment acceptance rate, appointment adherence, medical record completeness, and patient satisfaction.. **Results:** The proposed framework consists of five key components: strategic preparation and resource readiness, standardized clinical workflow, integration of self-ligating orthodontic technology, performance monitoring using measurable quality indicators, and continuous service improvement through periodic evaluation. Implementation of the framework supports improved service organization, enhanced clinical workflow efficiency, and better monitoring of orthodontic treatment outcomes.. **Conclusion:** The developed framework provides a practical model for implementing self-ligating orthodontic services in dental hospitals. It integrates clinical innovation with healthcare management principles and may serve as a reference for institutions developing modern orthodontic services while maintaining quality, efficiency, and patient-centered care.

Keywords: Dental hospital management; Healthcare service implementation; Orthodontic innovation service; Self-ligating braces; Service excellence.

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INTRODUCTION

Malocclusion is one of the most prevalent oral health conditions worldwide and affects both functional and psychosocial aspects of individuals. Epidemiological studies indicate that a significant proportion of adolescents and adults require orthodontic treatment to correct occlusal discrepancies, improve masticatory function, and enhance facial aesthetics.^{1,2} Untreated malocclusion may negatively influence oral health-related quality of life (OHRQoL), affecting self-confidence, social interaction, and overall well-being. Conversely, orthodontic treatment has been shown to significantly improve patient satisfaction, oral function, and psychosocial health outcomes.^{3,4}

Advancements in orthodontic technology have significantly transformed clinical practice over the past two decades. Modern orthodontic modalities include self-ligating bracket systems, clear aligner therapy, digital orthodontics, and computer-assisted treatment planning.⁵ Among these innovations, self-ligating bracket systems have attracted considerable attention due to their unique design, which incorporates a built-in clip mechanism that secures the archwire without the use of elastomeric ligatures. This design may reduce friction during tooth movement and potentially improve treatment efficiency.⁶

Self-ligating brackets have been widely adopted in contemporary orthodontic practice due to their potential advantages, including reduced chairside time, improved hygiene maintenance, and simplified clinical procedures. Although clinical evidence regarding their superiority compared with conventional brackets remains debated, several studies suggest that self-ligating systems may contribute to improved treatment workflow and patient comfort in clinical settings.⁷

Dental hospitals, particularly teaching dental hospitals, play an important role not only in providing clinical services but also in integrating education, research, and technological innovation within dental practice. The implementation of specialized orthodontic services requires comprehensive planning involving infrastructure readiness, trained human resources, standardized clinical protocols, and quality monitoring systems. Effective healthcare service management is therefore essential to ensure patient safety, service quality, and operational sustainability.^{8,9}

Nala Husada Dental Hospital in Surabaya has initiated the development of orthodontic services incorporating modern orthodontic technologies. However, successful implementation requires a structured operational framework that integrates clinical protocols with healthcare management strategies. Without a systematic implementation model, the adoption of new technologies may face operational inefficiencies and inconsistent service delivery.

Therefore, this study aims to develop a generic implementation framework for self-ligating orthodontic treatment services in dental hospitals, using Nala Husada Dental Hospital, Surabaya, Indonesia as a case model. The proposed framework is expected to support structured service development, improve clinical workflow efficiency, and enhance patient-centered orthodontic care.¹⁰

MATERIALS AND METHODS

Study Design

This study employed a descriptive implementation framework approach aimed at developing a structured service model for orthodontic treatment within a dental hospital setting. Implementation research is widely used in healthcare management to translate clinical innovations into practical service delivery systems that improve healthcare performance and patient outcomes.

Study Setting

The study was conducted at Nala Husada Dental Hospital, Surabaya, Indonesia. The hospital functions as both a clinical service facility and a teaching institution supporting dental education and training. Teaching dental hospitals play a strategic role in integrating patient care, professional education, and clinical research in dentistry. This study was conducted in accordance with institutional research guidelines. As the study involved service framework development based on institutional data and did not involve direct patient intervention, formal ethical approval was not required. Institutional permission was obtained from Nala Husada Dental Hospital.

Framework Development

The framework was developed through an analysis of orthodontic service implementation processes within the institution. The development process consisted of four main stages: 1) Pre-implementation analysis, 2) Clinical

service workflow design, 3) Integration of orthodontic innovation, 4) Post-implementation monitoring and evaluation. These stages were designed to ensure that the implementation of orthodontic services follows structured healthcare management principles and evidence-based clinical practice.

Service Components

The framework was structured using the healthcare management model consisting of five components: Input, Process, Output, Outcome and Continuous improvement. This model is commonly used in healthcare system evaluation to assess service performance, resource utilization, and patient outcomes

Quality Indicators

Service performance was evaluated using several operational indicators: Number of orthodontic patient visits, Treatment conversion rate, Patient compliance with follow-up visits, Completeness of orthodontic records, Patient satisfaction level. These indicators were selected based on healthcare quality monitoring frameworks and orthodontic service management principles reported in previous studies

RESULTS

Pre-Implementation Phase

The pre-implementation phase focused on strategic preparation involving human resources, infrastructure readiness, and clinical protocol development. Human resources included orthodontists, general dentists, dental nurses, administrative staff, and dental students involved in clinical training. Adequate professional competency among healthcare providers is a critical factor influencing the quality and safety of orthodontic services.

Infrastructure preparation included orthodontic instruments, radiographic equipment, diagnostic imaging systems, and electronic medical record systems. The integration of digital documentation systems supports improved clinical data management, treatment monitoring, and interdisciplinary collaboration within healthcare facilities.

Standard operating procedures (SOPs) were also developed to regulate the orthodontic treatment pathway. These protocols include diagnosis, treatment planning, appliance placement, follow-up visits, and retention management. Standardized protocols help ensure consistency of care and improve treatment outcomes in orthodontic practice.

Orthodontic Clinical Workflow

The orthodontic clinical workflow at Nala Husada Dental Hospital consists of a structured sequence of care stages: 1) Patient registration, 2) Initial screening, 3) Orthodontic consultation, 4) Diagnostic records (photographs, radiographs, study models), 5) Treatment planning, 6) Informed consent, 7) Active orthodontic treatment, 8) Periodic follow-up visits, 9) Retention phase, 10) Post-treatment evaluation. This structured workflow facilitates continuity of care, improves clinical documentation, and enhances treatment monitoring. Effective clinical workflows are essential for ensuring treatment consistency and improving patient outcomes in orthodontic services

Integration of Self-Ligating Brackets Orthodontic Treatment

Self-ligating bracket systems were introduced as part of orthodontic service innovation at the hospital. These brackets incorporate a built-in clip mechanism that holds the archwire without the need for elastomeric ligatures, which may reduce friction and simplify appliance management during orthodontic treatment.

The adoption of self-ligating systems aims to improve patient comfort, reduce chairside time, simplify appliance maintenance, and enhance clinical workflow efficiency. Previous studies have suggested that self-ligating brackets may improve treatment efficiency and reduce appointment duration compared with conventional bracket systems.

Monitoring and Quality Indicators

To evaluate service performance, several key indicators were established, including: Number of new orthodontic patients, Conversion rate from consultation to treatment, Patient adherence to scheduled visits, Completeness of orthodontic records, Patient satisfaction scores.

These indicators enable periodic monitoring of service quality and clinical outcomes. Continuous monitoring of service indicators is essential in healthcare management to identify performance gaps and improve operational efficiency.

DISCUSSION

The implementation of modern orthodontic treatment services within dental hospitals requires a combination of clinical innovation and effective healthcare management systems. Healthcare service delivery models emphasize the importance of structured service frameworks to ensure efficient resource utilization, patient safety, and quality of care. The framework proposed in this study integrates orthodontic clinical protocols with hospital management principles, aligning with healthcare system models that emphasize inputs, processes, outputs, and outcomes in service delivery.^{10,11}

Self-ligating bracket systems represent one of the technological advancements in contemporary orthodontics. These appliances incorporate a built-in clip mechanism that eliminates the need for elastomeric ligatures, which may reduce friction between the archwire and bracket slot and potentially facilitate more efficient tooth movement.¹² Some clinical studies have suggested that self-ligating systems may reduce chairside time and simplify orthodontic procedures, thereby improving clinical workflow efficiency. However, systematic reviews indicate that differences in overall treatment duration between self-ligating and conventional bracket systems may not be statistically significant in many cases.¹³

Table 1. Orthodontic treatment pathway

Stage	Clinical Activity	Purpose
Initial visit	Patient registration and screening	Identify orthodontic needs
Consultation	Orthodontic examination	Establish preliminary diagnosis
Diagnostic records	Cephalometric radiograph, intraoral photos, study models	Accurate treatment planning
Treatment planning	Selection of orthodontic modality	Determine treatment strategy
Appliance placement	Self-ligating bracket bonding	Initiate orthodontic treatment
Follow-up	Periodic adjustment and monitoring	Control tooth movement
Finishing stage	Final alignment and occlusal correction	Achieve treatment objectives
Retention	Retainer placement	Maintain treatment results

Another important consideration in orthodontic service implementation is periodontal health during treatment. Fixed orthodontic appliances can influence plaque accumulation and gingival inflammation. Recent systematic reviews have indicated that although self-ligating brackets may provide slightly improved plaque control due to the absence of elastomeric ligatures, overall periodontal outcomes between self-ligating and conventional systems remain comparable.^{14,15}

The findings of this study highlight the importance of structured clinical workflows in orthodontic services. Standardized treatment pathways including diagnostic assessment, treatment planning, appliance placement, and retention protocols are essential to ensure continuity of care and consistent treatment outcomes. Structured workflows also support effective clinical documentation and facilitate interdisciplinary collaboration within dental hospitals.^{16,17}

Table 2. Orthodontic Service Quality Indicators

Indicator	Definition	Target
New orthodontic patients	Number of new patients per month	Increasing trend
Treatment acceptance rate	Percentage of consultations converted to treatment	≥ 60%
Appointment adherence	Patients attending scheduled visits	≥ 80%
Medical record completeness	Complete orthodontic documentation	≥ 90%
Patient satisfaction	Patient satisfaction survey	≥ 85%
Appliance failure rate	Detached bracket events	Decreasing trend

In addition to clinical protocols, the integration of healthcare management indicators plays a crucial role in evaluating service performance. Indicators such as patient volume, treatment acceptance rates, appointment adherence, and patient satisfaction provide measurable parameters for assessing the effectiveness of orthodontic services. The use of quality indicators in healthcare systems has been widely recommended to support continuous service improvement and evidence-based decision making in hospital management.^{17, 18}

Teaching dental hospitals have additional responsibilities in integrating clinical service with academic training and research activities. Therefore, the implementation of structured orthodontic service systems not only improves patient care but also enhances clinical training opportunities for dental students and orthodontic

residents. Structured clinical systems facilitate standardized learning experiences and promote evidence-based orthodontic practice.^{19,20}

The framework proposed in this study may serve as a reference model for other dental hospitals aiming to establish modern orthodontic services incorporating self-ligating treatment systems. Future research should evaluate the effectiveness of this framework through multicenter implementation studies and long-term clinical outcome assessments.

In conclusion, the implementation of a structured orthodontic service framework using self-ligating bracket systems at Nala Husada Dental Hospital may improve the quality and efficiency of orthodontic care. The framework supports standardized clinical workflows, better treatment monitoring, and improved patient-centered services. Although self-ligating brackets may not always provide significantly shorter treatment duration compared with conventional brackets, they offer advantages in clinical workflow, chairside efficiency, and patient comfort.

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