



Advancing Oral Health Through the Integration of Multidisciplinary Approaches in Modern Dentistry: Bridging Technology, Research, and Patient Care

Akshata Chikali¹, Himani Patel², Aajumani Basumatary³, Nandita Katha⁴, Anukriti Kumari^{5*} and Khushi Ranwa⁶

¹Department of Community Medicine, Jawaharlal Nehru Medical College, KLE Academy of Higher Education and Research, Belagavi, India

²Private Practitioner, BDS, AMC Dental College and Hospital, India

³Consultant Orthodontist, Kokrajhar Baganshali, India

⁴Consultant Periodontist, Amritsar, Punjab, India

⁵Department of Oral Medicine and Radiology, School of Dental Sciences, Sharda University, India

⁶Private Practitioner, BDS, R.R Dental College and Hospital, India

***Corresponding author:** Anukriti Kumari, Department of Oral Medicine and Radiology, School of Dental Sciences, Sharda University, Greater Noida, Uttar Pradesh, India, Email: anukritishrma0@gmail.com

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Abstract

The factors that have transformed dentistry using multi-disciplinary approaches and oral health care procedures are discussed in the conventional and modern age. This way, it is interdisciplinary, where the various branches, including periodontics, prosthodontics, orthodontics, aesthetic dentistry, oral surgery, pediatrics, and others, reinforce the delivery of a mutually effective treatment regime. In this article, the described connections contribute to improved patient outcomes; for instance, before prosthetics placement, correction of the teeth position is combined with improving the appearance and managing complicated root canal treatment through surgical means.

This study highlights the relevance of interprofessional teamwork in the development of dentistry, the enhancement of patients' experiences, and the development of the dental field's future direction.

Keywords: 3D Imaging; AI in Radiography; CAD/CAM; Interdisciplinary; Prosthodontics

Introduction

Due to the increase in technology and greater patient focus, dentistry is experiencing many changes. Running through this change is the concept of interprofessional practice,

in which various specialties of dentistry work together to provide adequate care for their patient's oral health needs. This makes the solutions much more effective because we can offer a holistic, unique approach to all patients [1]. The clinical and/or scientific relations between dental specialties

accentuate the importance of teamwork. For example, when placing implants or prosthetics, a periodontist may collaborate with a prosthodontist to assess the health of the gums and establish a stable foundation for treatment [2]. In the same way, orthodontists and cosmetic dentists work together to offer corrective braces and dental cosmetic treatments such as dental veneers to create an optimal aesthetic result with proper occlusion [3].

More complicated operations like complex root canal treatments require the attention of oral surgeons and endodontists. At the same time, children and preventive care specialists are involved in early treatments such as fluoride treatments and orthodontic examinations for young children as they grow up.

However, constraints have been portrayed as being reduced with technological expansion to support this collaborative model. Biomaterial imaging technology like three-dimensional imaging, intraoral scanners, Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM), and Artificial Intelligence (AI) have changed the face of diagnostic certainty and planning of treatment. These innovations allow individuals from various dental specialties to connect, share data, and develop unique and individualized intervention plans. Furthermore, the use of robots and artificial intelligence-driven diagnostic systems changes the manner of implementing those procedures and sets a higher quality benchmark [4].

Here are concrete examples of how a holistic approach in dentistry benefits patients:

Implant Placement with Periodontics and Prosthodontics Collaboration: Strengthen the gums and bone quality to ensure the longevity and functionality of implants and minimize failure ratios.

Orthodontics and Cosmetic Dentistry: This course of treatment is ideal because braces improve teeth' functionality, while veneers improve their aesthetics.

Endodontics and Oral Surgery for Complex Root Canals: Complex situations require surgical treatment; teeth are not extracted, and the natural dentition is maintained.

Pediatric Dentistry and Preventive Care: First F treatments and the first orthodontic checkup help prevent cavities and crooked teeth during development and eliminate them as side effects.

Regenerative Medicine and Surgery: Tissue engineering in reconstructing periodontal, gum, or bone tissue after surgery provides functional and aesthetically satisfactory healing for

patients with extensive tissue defects [5].

Therefore, with the future of dentistry just around the corner, there will be much more integration and innovation.

This article examines how multidisciplinary teamwork is present and future in dentistry in terms of diagnosis, treatment planning, and patient outcomes, utilizing up-to-date technology and patient friendliness.

Review

Advancements and Real-World Applications in Teledentistry

Remote Consultations—There are the following possibilities: Patients in rural areas can request a video call with a dentist for diagnosis, treatment, or follow-up.

AI-Assisted Remote Monitoring—Artificial intelligence now enables mobile applications where patients can provide photos of their teeth and recommendations for a preventive or corrective program [6]. **School-Based Oral Health Programs**—Schoolchildren are screened through teledentistry with those who require an office visit or preventive care indicated by the dentist.

Post-Surgery Follow-Up means patients who underwent implants or surgery can physically talk to their dentists without presenting themselves for follow-up appointments [7] (Figure 1).

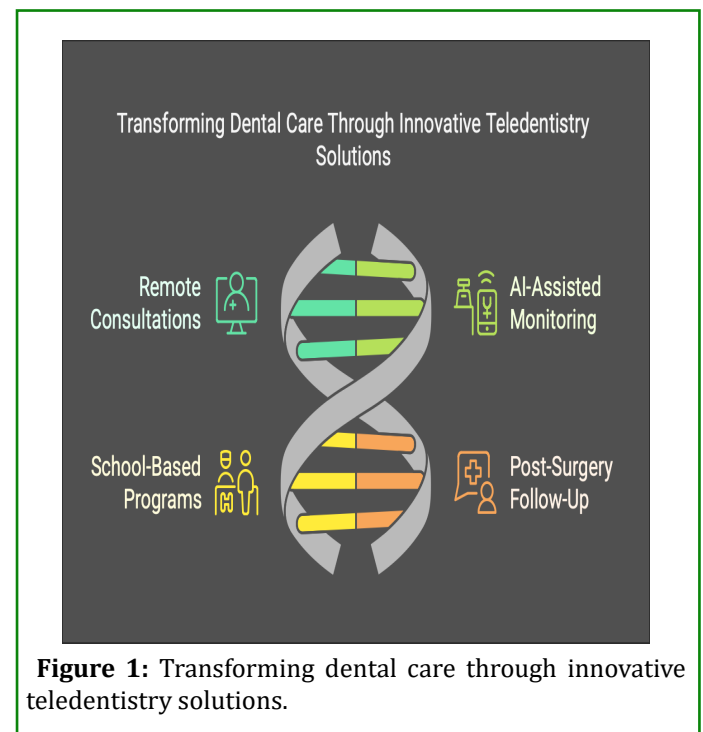


Figure 1: Transforming dental care through innovative teledentistry solutions.

Table 1 illustrates the recent advancements in Dentistry.

S.NO	Subjects	Recent advancements
1	Restorative Dentistry	Accurate DWA integration to replace analog techniques, improving chair-side restorative time, and the use of bioactive materials that enhance tooth remineralization.
2	Prosthodontics	The dental application should adopt Zirconia and lithium disilicate materials to enhance natural appearance and long-lasting restoration.
3	Orthodontics	Digital scanning and 3D simulation of the treatment outcomes mean that there is accurate planning to undertake and involve the patient.
4	periodontics	Digital scanning and 3D simulation of treatment outcomes allow precise planning and patient engagement.
5	Public health dentistry	Use of laser technology for minimally invasive treatments and sedation techniques for uncooperative children.
6	Oral surgery	Transoral Robotic Surgery (TORS): TORS utilizes robots to reach and treat mouth and throat tumors, making no incisions on the outer surface of the body. Most of these procedures are less invasive and have advantages like reduced bleeding, shorter hospital stays, and fewer complications than those associated with open surgeries.
7	Cosmetic dentistry	Laser veneers and gum contouring.

Table 1: essential subjects and their recent advancements [7].

In children, specific specialists, often called pediatric dentists, are very important in preventing dental complications since they offer early orthodontic evaluations and basic preventive procedures, such as the application of fluorides. Many health issues can be prevented when young; hence, there is a need to ensure children take their health checkups seriously [8]. On the other hand, general dentists cooperate with specialists working on complex cases, such as oral surgeons and endodontists, if a complicated root canal treatment is to be done, including surgery, to ensure the maximum results for the patient (Figure 2).

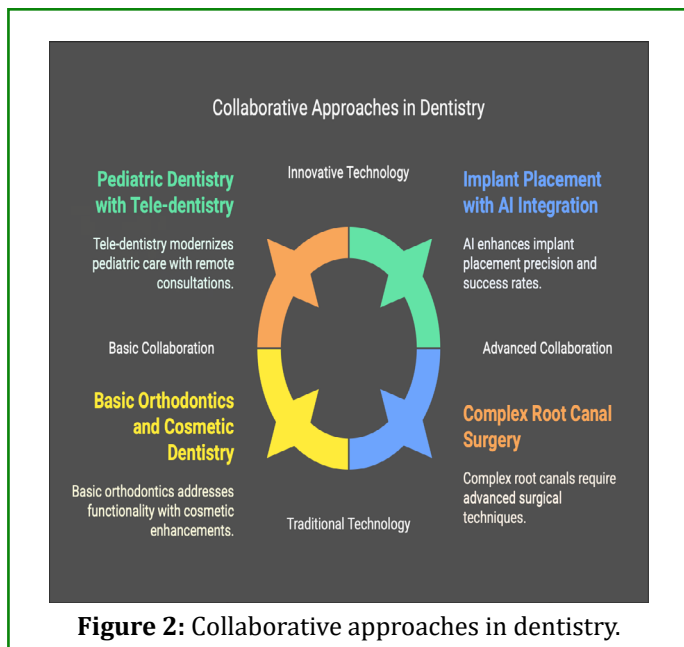


Figure 2: Collaborative approaches in dentistry.

Discussion

The handling of cases demonstrates how this approach works in real-life situations. For example, people with severe dental injuries receive tremendous help from surgeons, prosthodontists, and aestheticians; such outcomes are impossible if one specialist works individually.

We might face a few drawbacks during this transition to newer technologies and teledentistry.

Financial Constraints [9].

High Initial Costs—Equipment such as 3D imaging machines or CAD/CAM systems is capital-intensive, which most urban or rural dental practitioners may not afford to invest in.

Maintenance Costs—Maintenance and replacement of equipment and other operational costs comprise the rest of the expenses that continue to cause financial strain [10].

Patient Costs—Such advances in technology can also increase treatment costs, which in turn may deprive patients who do not have adequate health insurers or means of adequate basic medical care.

Need for Specialized Training [11].

Skill Gap—Specialized training is needed to use sophisticated equipment such as an intraoral scanner or an AI tool, which may be more time-consuming and expensive.

Continued Education—They stated that interventions requiring constant updating due to rapidly developing technologies will likely change practice, time, and costs.

Integration Challenges

Interoperability—Interactions between various technologies and platforms, especially in interdisciplinary functions, can require coordination, which presents a leadership challenge [12].

Ethical and Privacy Concerns

Data Security—Teledentistry and AI work with identifiable patient information, which makes the application's security extremely important for protecting against cyber threats [12].

Reliability—The Use of these tools in diagnosis may be misleading if algorithms are not adequately verified or customized to patients with different characteristics [13].

While traditional methods have long served as the foundation of dental practice, they are limited in several key areas that advanced approaches address. One of the most significant limitations is the lack of precision in diagnostics and treatment planning. Traditional diagnostic tools, such as 2D X-rays, do not provide the detailed, 3D perspective that modern imaging technologies like CBCT (Cone Beam Computed Tomography) or intraoral scanners offer. This lack of precision can sometimes lead to misdiagnosis or suboptimal treatment outcomes [14].

Another challenge with current methods is the siloed approach to patient care. Different specialists—such as periodontists, prosthodontists, and orthodontists—often work independently, which can result in fragmented care that fails to integrate the various aspects of a patient's treatment needs. The absence of collaborative treatment planning means that the different specialties may not always be fully aligned, leading to longer treatment times, potential treatment redundancies, or conflicting approaches [15].

Additionally, traditional methods often involve multiple office visits, which can be both time-consuming and uncomfortable for patients. The use of manual impressions, in particular, can cause discomfort, while the reliance on analog techniques may result in longer wait times for restorations or other treatments. With the rise of digital impressions, 3D printing, and same-day CAD/CAM restorations, patients can experience a more comfortable, streamlined treatment process.

Despite the benefits of newer technologies, there are still significant barriers to their widespread adoption. The high

initial cost of equipment like 3D imaging systems, CAD/CAM machines, and AI diagnostic tools makes it difficult for many smaller practices to invest in these technologies. Additionally, ongoing maintenance costs can place a financial strain on practices, which may further exacerbate disparities in access to advanced care. As a result, some patients may be excluded from the benefits of these innovations due to financial constraints [16].

Finally, there is a notable skill gap when it comes to using advanced technologies. Specialized training is required to effectively operate tools like intraoral scanners, digital imaging systems, and AI diagnostics. This training can be both time-consuming and costly, posing challenges for dental professionals who are already managing busy practices. Furthermore, the rapid pace of technological advancements means that practitioners must continually update their skills to stay current, which can add another layer of complexity to their work.

Conclusion

The integration of advanced technologies and multidisciplinary approaches in modern dentistry represents a significant leap forward in the way oral health care is delivered. By combining the expertise of various dental specialties—such as periodontics, prosthodontics, orthodontics, and oral surgery—alongside cutting-edge technologies like 3D imaging, CAD/CAM systems, AI diagnostics, and teledentistry, the field is moving toward a more collaborative, efficient, and patient-centered model of care. These advancements are not only enhancing the precision and speed of diagnoses and treatments but also improving the overall patient experience by reducing discomfort, wait times, and the need for multiple visits.

However, while the promise of these innovations is vast, there remain significant challenges to their widespread implementation. High initial costs, the need for specialized training, and issues related to data security and interoperability are obstacles that need to be addressed. Moreover, financial barriers could limit access to these technologies, particularly in underserved or rural areas, creating a gap in care quality between different regions and demographics.

Ultimately, the future of dentistry lies in overcoming these barriers and ensuring that advanced, patient-centered care becomes accessible to all. As the field continues to evolve, there is immense potential for improved clinical outcomes, more streamlined treatment processes, and a more holistic approach to patient care. By embracing technological advancements and fostering interdisciplinary collaboration, modern dentistry can continue to raise the standard of care

and enhance the quality of life for patients worldwide.

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