

Digital Technologies in Dentistry

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Introduction

Digital Dentistry is an emerging technology in dental field, which will enhance patient's treatment modality in future. It provides digital equipment available to cosmetic dentists and implant dentists. Digital dentistry is not a wave of future, its occurring now. Whether a dentist embraces a new technology will define his/her practice and possibly future. The purpose of this article is to examine the concept of digital dentistry, its advantages and limitations and make statements and observations in specific areas of digital dentistry based on research. The success of incorporating a new technology in dental office is dependent on the knowledgebase of not only the dentist but the entire dental team.

The use of advanced digital technologies (ADT) in the fabrication of dental restorations has progressed well past its first introduction as a dental milling system in the early 1980's. Developments of scanning technologies provide the opportunity to scan casts, impressions, and intra-orally.

The use of digital computers in biomedicine traces its origin closely to the seminal events that mark the beginning of the computer revolution. Digital dentistry may be defined in a broad scope as any dental technology or device that incorporates digital or computer-controlled components in contrast to that of mechanical or electrical alone. It is the "application of computer and information science to improve dental practice, research and program administration.

In the dental world, it means using any digital technology or device

involves computer versus mechanical or electrical stand-alone technology or service. This transformed how people communicate, learn or work. The array of digital equipment available to cosmetic dentist, general dentist and implant dentist etc has increased significantly. Such advancements in dental technology enabled patients to receive modern solutions to traditional dental problem.

The following list represents the majority of areas, which incorporate some type of digital components;

1. Shade Matching
2. Caries diagnosis
3. Occlusion and TMJ analysis and diagnosis
4. Computer-aided implant dentistry- including design and fabrication of surgical guides.
5. Digital radiography-Intraoral and Extra oral including cone beam computed tomography (CBCT).
6. Electrical and surgical implant hand pieces.
7. Photography - Extra oral and Intraoral.
8. Practice and patient record management - Including digital patient education.
9. Lasers.
10. CAD/CAM and intraoral imaging - both laboratory and clinician controlled.

Advantages of Digital Dentistry

- Improved efficiency-Both cost and time.
- Improved accuracy in comparison to previous methods.
- High level of predictability of outcome.

- Technology will make practice management more efficient.
- Educational software and intelligent assistants will increasingly support the needs for decision making in clinical practice.

- d) Conference presentations
- e) Reviewing of literature
- f) Entertainment & family use
- g) Continuing dental education.

Limitations of Digital Dentistry

- The major limitation of most areas of digital dentistry is cost. To adopt new technology often requires a higher capital investment, especially at the “innovator” or “early adopter” stage.
- The other main limitation for the clinician to explore these new advancing dental technology is lack of training, knowledge and desire.
- Misunderstanding the new technology tends to foster slower adoption rates.

Digital Dentistry Applications

The computers are used for many purposes in the field of dentistry and can be broadly classified as:

Administrative applications

Clinical applications & Other applications

Administrative applications

They are aimed for a smooth running of the dental clinics, the hospitals & the dental institutions

- a) Patient appointments and recalls
- b) Billing
- c) Accounting
- d) Correspondence
- e) Inventory control and supply orders
- f) Dental insurance claims
- g) Document preparation & word processing
- h) Referral information
- i) Missed appointments follow-up Clinical Applications.

The computers are very useful for the dentists in their professional practice

- a) Patient record storage & retrieval
- b) Clinical diagnosis and treatment planning
- c) Patient motivation & awareness
- d) Computerized cephalometrics & growth prediction.
- e) CAD-CAM
- f) Computer assisted densitometer image analysis system
- g) For special purposes like computerized spirometers, blood chemistry & gas analysers, ultrasound scanners and CT scanners
- h) Radiovisuography (RVG) technique
- i) Storage of patient photographs, radiographs & study models.

Other applications

- a) Controlling the circulation of books and journals and their availability in the library.
- b) Creating a data base of survey information.
- c) Case presentation

A. Computerized Dental Patient Record

1. Electronic dental patient record (EDPR) is storing patient information in a digital format that can be retrieved, duplicated, cataloged and transmitted as needed.
2. Record storage becomes difficult as the practice ages, bulky paper records and study models pose a problem of organization and space.
3. Current technology is available for in office use of computers combined with video cameras to copy radiographs, study models, photographs and hand written records for storage in compact digital form.
4. With the EDPR there is no longer necessity to maintain a fussy paper appointment book so the new dentistry era can be better called as paperless dentistry.

Dental education's complete adoption of digital dentistry will require the aspirational spirit of early adopters of ever-changing technologies who possess foundational knowledge and the integrity to apply an evidence based approach to change. Continued change will present itself in to the realm of restorative dental therapy and positive, assured steps in the right direction will be needed. A strong curriculum that embraces fundamentals of technology and biology can serve as a foundation supporting ongoing change. Integration of a comprehensive digital curriculum in our schools that embraces the knowledge and application of emerging technologies is an important transformational point in the broader adoption of digital dentistry.

Digital technology brings many advantages to dentistry. While these advantages are often remarkable and clearly distinguish digital from conventional techniques, adoption has been slow. In all digital dental applications from electronic patient records to selective laser sintering of complex prosthetic frameworks, the common advantages of improved communication, increased control, greater quality and data archiving, and improved patient experiences simply cannot be matched using exiting conventional methods. Despite the general and other specific advantages available through digital dentistry, significant barriers to adoption remain. Several factors influencing the adoption of technology, including familiarity of knowledge and education, are frequently overlooked as central drivers of adoption. The lack of information and skill necessary to integrate and utilize technology efficiently and the apprehension concerning acquiring this information and skill are underappreciated factors that limit adoption. Other factors frequently mentioned include cost, accuracy or utility, and outcomes. The factors that drive adoption of technology are as important as the factors that drive innovation.