Digital Dentistry : An Advancement of Dentistry

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Introduction:

Digital transformation is the universal outburst happening in every field of human life and touches every activity of us. Health sector is no exception for it. Continuous progress in information technology has made it possible to overcome the limitations and hurdles that existed in health related issues just a few times ago. Digital workflow in dentistry streamlines the working process, reduces treatment times, improves accuracy and overall enhances patient satisfaction.

The rapidly rising branch of computer-aided design/ computer-aided manufacturing (CAD/CAM), Digital imaging, tele-dentistry, digital orthodontics, rapid prototyping etc are influencing and are capable of changing the pattern of dentistry of 21st Century. New opportunities have opened up in health sectors by using artificial intelligence (AI) and machine learning (ML). By creating virtual dental patients and non-invasive simulations comparing different results before any clinical intervention resulted in more accuracy for management of patients. Increased IT power has promoted profitable and promising technologies which will be helpful for future unseen possibilities. Digital x-rays and CBCT are used to obtain detailed three dimensional images of the oral structures. Intraoral scanners replace traditional dental impressions by capturing digital images of patient's teeth and soft tissues. CBCT scans and specialized software are used to precise planning of dental implant placement.

Some of key components and application of digital dentistry include;

1. Computer-aided design/ computer-aided manufacturing (CAD/CAM):

CAD software enables dentists and technicians to design and customize dental crowns, bridges etc digitally and allows precise and personalized solutions for every patient. Cam system uses 3-D printing and milling techniques accurately and precisely. CAD/CAM technology is in process to change dentistry and will replace more and more of the traditional techniques in fabricating dental restorations in near future.

2. Tele-dentistry;

Digital technologies enable dental surgeons to provide remote consultations, monitor oral health and advise treatment to the patients without visiting them in person. The growing number of the elderly population with reduced mobility and/or nursing homestay, special-care patients, and people residing in remote areas, would benefit significantly from tele-dentistry.

3. Digital Orthodontics;

Digital advancement in the form of Clear aligner, which is designed by using computer software, is customized to gradually move teeth into their normal desired position.

4. Virtual Reality and Augmented Reality (VR/AR);

VR and AR are increasingly being used in dental education and patient communication. They will be helpful to the patient to understand the real problems. Realistic training is possible for dental students with these methods. AR is an interactive technology improving a real-world environment by computer-animated perceptual information.

5. Rapid Prototyping (RP);

RP is a method to quickly and automatically construct three-dimensional (3D) models of a final product or a part of a whole using 3D-printers. RP offers great potential in dental technology for mass production of dental models, the fabrication of implant surgical guides etc. It would be possible to synthesize biomaterials to artificially build lost tooth structures using RP technology.

6. Artificial intelligence (AI) and Machine Learning (ML);

The use of AI and ML in dentistry is the entire field of diagnostic imaging in dento-maxillofacial radiology focusing

on automated localization of cephalometric landmarks, diagnosis of osteoporosis, maxillofacial cysts , tumours, and identification of periodontitis/periapical disease. Computer software analysing radiographs has to be trained on huge datasets ("big data") to recognize meaningful patterns.

7. Electronic health records (EHR);

Electronic health records (EHR) with standardized diagnostics and generally accepted data formats are the mandatory door opener to personalized health care and predictive models investigating a broader population. The structured assessment and systematic collection of patient information is an effective instrument in health matters.

Conclusion;

Digital dentistry, this requires managing expectations pragmatically and ensuring transparency for all stakeholders: patients, healthcare providers, university and other research institutions, medical industry, public media, and state health policy. It is desirable to every dental surgeon to receive proper training and update on the latest advancement of the latest technologies for patient benefit and research.

Reference;

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