The Imperative integration of AI in dental undergraduate curriculum: Addressing future needs for dentistry students.

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Introduction

Artificial Intelligence (AI) is the ability of machines to perform functions that normally require human intelligence and is making significant strides in various industries and professions. Dentistry, being a progressive, ever-growing health profession, is no exception. Its use in restorative dentistry, maxillofacial surgery, orthodontics, endodontics and periodontics has been implemented to augment capabilities of the dentists, improve their decision-making, and enhance overall patient care [1] AI has not been widely accepted yet but as its future looks promising, it should be incorporated in Dental Curriculum [2].

AI can play multiple roles to facilitate dentists in their practices or research projects. Following is brief description of few tasks; it can effectively perform for the clinicians.

Diagnosis and imaging

AI-powered imaging and diagnostic tools are being developed to aid dentists in detecting oral health issues more accurately and quickly. For example, AI algorithms can analyze dental X-rays and scans to identify early signs of tooth decay, gum disease, or even oral cancer. Intraoral Periapical radiographs are found inefficient in early detection of periapical lesions but Cone Beam Computed Tomography (CBCT) is found more accurate in the diagnosis of periapical lesions as compared to periapical ones. A study showed that the total sensitivity for the detection of periapical lesions was 28% for periapical radiographs and up to 100% for CBCT [3].

Treatment planning and prognosis

AI can assist dentists in creating personalized treatment plans for patients based on their unique dental conditions, medical history, and preferences. AI-driven software can suggest appropriate treatment options, materials, and techniques, taking into account evidence-based best practices. AI-powered software can assist dental clinicians in treatment planning for braces and aligners that can predict the movement of teeth over time. It can be effectively used in speech therapy applications to help individuals with speech and language disorders, especially those related to dental or oral issues. AI has made Root Canal Treatment easy for the dental clinicians as it accurately measures root canal curvatures and three-dimensional canal changes [4]. Another study found it not merely accurate but more efficient than clinical practitioner at determining the root canal morphology [5].

AI can analyze vast amounts of patient data to identify patterns and trends, enabling dentists to predict oral health risks and design preventive measures accordingly. This proactive approach can potentially lead to improved patient outcomes and reduced treatment costs.

Prostheses design & fabrication

AI can assist in the design and fabrication of dental prosthetic appliances and implants, ensuring precise fits and optimal aesthetics.

Virtual Assistants and Chatbots

Dental practices can use AI-driven virtual assistants and chatbots to handle patient inquiries, appointment scheduling, and general information dissemination.

Patient monitoring

Artificial Intelligence can be used to manage patient's clinical records. It can also manage appointments quite efficiently, reducing administrative burdens on dental offices. Chatbots and virtual assistants can handle appointment scheduling and respond to common queries from patients. This helps streamline administrative tasks and improves patient communication. AI can generate educational content and simulations to help patients understand their dental conditions and treatment options better and can play a role in securing patient data by monitoring for potential breaches and suspicious activities within dental practice management systems. AI-powered dental wearable's and monitoring devices can track patients' oral health habits and provide real-time feedback. These devices can remind patients to brush, floss, or maintain oral hygiene routines, encouraging better dental health practices.

Natural Language Processing (NLP)

NLP capabilities of AI can be utilized to interpret and analyze text-based medical records, research papers, and patient histories, assisting dentists in staying up-to-date with the latest advancements and evidence-based practices.

Dental profession has welcomed several changes over the past decade, but dental education remains principally old-styled [6]. Dental Curriculums need to extend beyond courses that

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include basic and clinical sciences by incorporating courses to improve students' ability to practice in an AI-driven environment [7]. Incorporating AI into dental education will produce future dental professionals who have a deeper understanding its potential and become better-equipped to leverage these technologies to improve patient care and their treatment outcomes [8]. Following simple steps are proposed to integrate AI in dental curriculum.

Curriculum review

Review the existing dental curriculum and identify areas where AI can be beneficial like diagnostics, treatment planning, decision making, patient management, or research. AI could be included as a part of existing courses in the curriculum or as a separate module. Regularly review and update the included AI curriculum to keep it aligned with the latest advancements in the field.

Courses development

Define clear learning objectives and outcomes for incorporating AI into the curriculum and develop specific courses or modules that incorporate AI-related topics and discussions into relevant courses to introduce students to the potential applications and advancements in dentistry. Incorporate AI tools and software into clinical training. Use of AI-based diagnostic tools or virtual reality simulations for practical training will be advantageous and helpful in students' learning. Make sure these courses align with the curriculum and include hands-on exercises and practical applications.

Resources allocation

Assign resources for acquiring AI tools, software, and hardware required for the curriculum. This may include AI-powered diagnostic software, virtual simulators or access to relevant databases.

Collaboration

Develop collaboration between dental schools and school of computer science or AI departments within the university. This will foster research opportunities and ensure access to cutting-edge AI technologies.

AI workshop and seminars

Organize workshops and seminars led by experts in AI and dentistry. These sessions can provide insights into the latest AI technologies, their applications in dentistry, and how they can improve patient outcomes.

AI-powered simulation software

Utilize AI-powered simulation software to create virtual dental patient scenarios. This allows students to practice their skills, diagnose various oral conditions, and plan treatments in a risk-free environment.

Digital Dentistry and AI

Introduce students to the integration of AI in digital dentistry, including applications in radiography, 3D imaging, and CAD/CAM technology. This can enhance diagnostics, treatment planning, and the creation of dental restorations.

Continuing education for faculty

Offer training and workshops for dental faculty members to keep them updated on AI advancements relevant to dentistry. Faculty members who are well-informed can effectively incorporate AI concepts into their teaching methods.

Assessment and evaluation

Develop methods to assess students' understanding and proficiency in AI-related concepts. Consider integrating AI-related questions in exams to gauge their knowledge and critical thinking skills.

Feedback system

Establish feedback mechanisms to collect input from students, faculty, and stakeholders to continuously improve the AI curriculum.

No doubt, AI offers several advantages to future dentists, it is essential to make sure that dental professionals receive adequate training in utilizing AI tools effectively and ethically. It will be possible if AI is integrated in dental curriculum at an undergraduate level.

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