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Editorial

The application of artificial intelligence in dentistry: Revolutionizing dental procedures and beyond

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Traditionally, dentistry has depended upon clinical knowledge, dexterity in hands, and patients' confidence for success. In recent times, the twenty-first century marked an epochal transition where artificial intelligence is being integrated seamlessly within healthcare settings. Artificial intelligence was initially reserved for academic studies and speculative talks; today it's integrated into diagnostic devices, therapeutic algorithms, digital design systems, and healthcare interaction applications. Beyond displacing dentists entirely, artificial intelligence is developing into a smart companion that boosts diagnostic accuracy, streamlines operations, and reinforces data-driven medical practices significantly.

1. Diagnostics: Enhancing Accuracy beyond Human Vision

Advanced AI-powered tools are revolutionizing how dentists analyze X-rays and other imaging data. Radiographs and cone-beam computed tomography analysis employ algorithms for detecting cavities, periodontal issues, root canal pathology, and structural anomalies. In dental implants, AI identifies critical anatomical features like the inferior alveolar nerve and sinuses, ensuring secure outcomes. Pediatric dentistry benefits significantly from specialized AI tools which assess tooth decay quantitatively, translating human evaluations into concrete data points, enhancing precision and facilitating clearer discussions with parents. AI technologies can refine low-quality radiographs, enhancing their reliability in diagnosis.[1]

2. Orthodontics and Intelligent Patient Monitoring

AI has introduced significant efficiency in orthodontic care. Patients periodically upload intraoral photographs, which AI analyzes for changes in tooth positions, bracket failures, or aligner non-compliance. This minimizes redundant consultations, shortens treatment timelines, and improves patient satisfaction. AI-driven predictive modeling aids in designing treatment plans for alignment therapy by providing detailed forecasts of results.

3. Restorative, Periodontal, and Implant Applications

AI applications in prosthodontics are particularly impactful. Implantology: AI analyzes CBCT images for precise implant placement, accelerating treatment planning and enhancing accuracy. Periodontics: Voice-activated record systems capture probing depths and periodontal indices in real time, reducing clerical errors. Restorative Dentistry: CAD/CAM systems combined with AI optimize crown and bridge design, ensuring correct occlusion and aesthetics, thereby improving prosthetic outcomes.

4. Beyond the Chair: Documentation, Administration, and Education

Artificial intelligence expands its applications into areas such as administration and education besides clinical use. AI scribes automatically generate patient summaries, treatment notes, and referral drafts, significantly reducing documentation workload. Insurance processing benefits as

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AI standardizes records, reducing claim rejections and improving medico-legal compliance. Dental education is enhanced through AI tools for radiograph analysis, prosthesis design, and simulation-based training, ensuring uniform learning outcomes.

5. Latest Trends in AI (2024–2025)

AI-assisted CBCT segmentation for anatomical mapping in implantology. Quantitative pediatric caries detection and communication tools. AI-based image enhancement for reliable diagnostics from poor-quality radiographs. Ambient AI scribes for real-time documentation, reducing clinical burnout. Predictive analytics for assessing implant success and prosthesis longevity.

6. Ethical and Professional Responsibility

AI integration brings important ethical considerations. Clinical Oversight: Dentists must remain the final authority in decision-making. Risk of Overdiagnosis: Algorithmic outputs must be critically evaluated to avoid unnecessary treatment. Data Security: Compliance with HIPAA/GDPR regulations and strict patient consent protocols is vital. Transparency: Documenting AI usage in clinical records builds accountability and maintains patient trust.

7. Adoption Path for Modern Dental Practices

A structured approach ensures successful AI adoption. Begin with AI-based radiograph analysis for caries and bone evaluation. Implement orthodontic monitoring with AI for aligner patients. Use AI scribes for reducing documentation workload in complex treatments. Apply voice charting for periodontal and prosthodontic documentation. Conduct regular audits comparing AI-assisted results with traditional outcomes.

8. Conclusion

AI has evolved into an indispensable cornerstone of modern dentistry. Prosthodontists benefit from its unmatched precision in diagnosis, treatment planning, implant rehabilitation, and prosthesis design. The power of AI lies in augmenting human expertise, not replacing it. Dentists who adopt AI responsibly will define the future of oral healthcare by harmonizing empathy with precision, personalization, and innovation.

9. Conflict of Interest

None.

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