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Strategic Management of Human Resources in AI-Integrated Dental Laboratories

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Objectives The integration of Artificial Intelligence (AI) into dental laboratory workflows represents a significant transformation in operational efficiency, workforce structure, and economic performance. AI-driven technologies, including CAD/CAM systems, automated manufacturing, and predictive analytics, enhance precision, standardization, and productivity in prosthetic dentistry while requiring substantial organizational adaptation.
Methods This study aimed to evaluate the impact of AI adoption on human resources, operational processes, and economic sustainability in modern dental laboratories. A multidisciplinary analytical approach was applied, incorporating peer-reviewed literature, economic models, and case-based evidence from AI-integrated laboratory systems. Key performance indicators included production time, labor costs, error reduction, and return on investment (ROI).
Results The findings indicate that AI implementation improves workflow efficiency, reduces variability, and increases production capacity. Simultaneously, it transforms workforce requirements, shifting roles toward digital design, data management, and system supervision. Despite high initial investment, long-term economic benefits include reduced material waste, optimized labor allocation, and improved scalability, with ROI typically achieved within 3–5 years.
Conclusions AI does not replace human expertise but redefines it. Sustainable integration requires strategic human resource management, continuous professional development, and adaptive organizational models that balance automation with human oversight, ensuring long-term operational and economic efficiency.