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The rise of artificial intelligence in respiratory primary care and pulmonology: a scoping review

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Abstract-

Artificial intelligence (AI) is rapidly advancing respiratory disease management, from diagnosis to population lung health. This scoping review synthesizes the most promising uses of AI in respiratory medicine, with a particular focus on pulmonologists and family physicians interested in lung health. In diagnostics, deep-learning systems streamline chest-imaging workflows by triaging radiographs, detecting COVID-19 pneumonia, and classifying lung nodules on CT. In pulmonary function testing, algorithms detect technical errors and classify spirometric patterns, some claiming to outperforming pulmonologists. Acoustic analysis of cough, breathing, and speech captured on smartphones or wearables offers non-invasive decision support. For monitoring and prediction, AI helps shorten weaning from mechanical ventilation and guides closed-loop strategies for acute respiratory distress. In chronic care, connected devices integrated with environmental data help to forecast asthma and COPD exacerbations, while telehealth and predictive models enable earlier, more personalized interventions. Additional gains are emerging in paediatrics, sleep medicine, lung ultrasounds, and public health. Realizing these benefits will require rigorous multicentre validation and real-world evidence. It will also require proactive bias detection and mitigation with inclusive sampling and equity audits. High-quality, interoperable data and explainable models are needed to enable human oversight. Practical issues such as digital literacy, device access, and usability for children, older adults, and other vulnerable populations also matter for applications requiring patient interaction. With sustained collaboration among clinicians, engineers, AI experts, industry, regulators, and scientific societies, AI can increase the time invested in a satisfactory clinician-patient relationship. With all likelihood, AI can also measurably improve efficiency and accuracy across multiple domains of respiratory care.

Index Terms- Computational biology and bioinformatics; Diseases; Health care; Mathematics and computing; Medical research

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