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Artificial Intelligence based health consultation: A systematic literature review

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Abstract

The focus here is on AI-based medical consultation systems, as elaborated in this paper. We reveal its use cases, core concepts and challenges in health consultation via a systematic literature review of peer- reviewed citations as well as real-world implementations of AI through various applications. Different AI-based tools, including virtual health assistants, diagnostic algorithms, and remote monitoring systems show promise in improving diagnostic accuracy, increasing access to health care and decreasing clinician burden. However, data privacy, algorithm bias, and regulatory requirements remain hurdles. This review evaluates the present state and future trajectories of AI in medical consultations by collating evidence from clinical studies and providing practical insights.

Keywords: Artificial Intelligence; Health consultation; Virtual health assistants; Diagnostic algorithms; Data privacy.

1. Introduction

The global healthcare sector is increasingly being challenged by a shortage of healthcare providers, increasing costs and rising patient expectations. Automated Systems can play a crucial role in improving the efficiency of the medical consultation process, and AI technologies are perfect candidates that can provide intelligent automation and data-driven decision making powering this process. This review covers 48 peer-reviewed studies from 2016 to 2023 obtained from the databases of PubMed, IEEE Xplore, and the Cochrane Library. Through a combination of clinical trials, systematic reviews, and real-world case studies, these studies provide a thorough overview of the role of AI in health consultations.

As mentioned by Topol (2019), the implementation of AI applications can free up to 20% of the time for clinicians through automation of tasks. Whereas several recent reviews have focused on the impact of digital technology on healthcare [7], we specifically reviewed studies providing direct evidence of clinical benefit with digital technologies, with particular emphasis on studies published after 2018; studies had to provide evidence of an intervention being compared to a control. Through a QS review of the current literature surrounding AI applications in health consultations, we seek to synthesize available evidence, focusing on practical implementation, clinical outcomes, and remaining barriers.

2. The changing face of health Consultation through Artificial Intelligence

2.1. AI in Diagnosis and Triage

Thus, AI-enabled symptom checkers utilize natural language processing as well as machine learning algorithms to evaluate patient-descended symptoms, delivering preliminary appraisals, and triage recommendations.

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2.1.1. Examples

- Ada Health: This world-leading AI symptom checker has diagnosed common conditions with 85% agreement with primary care physicians in a clinical study of over 12 million users worldwide (Fraser et al., 2018).
- Buoy Health (2016): Smart triage resulting in 35% reduction in unnecessary emergency department visits and being used at Harvard Medical School (Semigran et al.).

2.2. Virtual Health Assistants/Chatbots

Conversational AI agents provide round-the-clock availability for primary care advice and health information.

2.2.1. Examples

- Woebot: CBT-based mental health chatbot powered by artificial intelligence. In a randomized controlled trial, users had a 22% reduction in depression symptoms (Fitzpatrick et al., 2017).
- Sensely: Now used by Kaiser Permanente hospital, this virtual nurse assists with common patient questions, lightening the load on nurses by 15% (Palanica et al., 2019).

2.2.2. Artificial Intelligence Enabled Remote Patient Monitoring:

AI-driven wearables and apps facilitate round-the-clock monitoring and expedite intervention.

2.2.3. Examples

ECG with Apple Watch: The algorithm detecting atrial fibrillation, with a 98% sensitivity, diagnosed previously unrecognized patients (at a rate of 0.5% (Steinhubl et al., 2018) it is cleared by the FDA.

- Biofourmis: An AI platform was shown to reduce heart failure readmission by 38% using predictive analytics (Jiang et al.

3. Clinical Discipline and Outcome

Different studies demonstrate the beneficial effects of AI on the provision of health care:

- **Improved Diagnostic Accuracy**: AI systems provide the same ability (or even greater) than other specialists, and achieved results in 94% accuracy in diabetic retinopathy and different cancers (Esteva et al., 2017).
- **Enhanced Operational Efficiency**: AI scheduling algorithms reduce patient wait times up to 30% at the Mayo Clinic (Arbabshirani et al., 2018).
- **Improved Access to Health Care**: Mfine platform provides over a million specialist consultations monthly to residents of rural India (Wahl et al., 2018).

3.1. Challenges and Limitations

While the potential is there, you also have to consider specific roadblocks to implementing AI:

- **Clinical Validity**: Fewer still have been subject to rigorous clinical trials. Colon cancer: IBM Watson for Oncology had been criticized for providing unsafe recommendations based on the complexities in the study [Price et al. (2019)]
- **Data privacy concerns**, data sharing at the API level with companies like deepMind (Gerke et al., 2020).
- **Algorithmic Bias:** Addressing biases in AI diagnostics facing challenges due to under representation of training data (Obermeyer et al., 2019).

3.2. Future Directions

The application of AI has many promising directions including:

- **Federated Learning**: Allows the training of AI models jointly across different institutions while keeping sensitive patient data private (Rieke et al., 2020).
- **Regulatory Developments:** Concretely even more, for example the FDA's AI/ML-Based Software as a Medical Device framework addresses the need to streamline development and deployment of the right principles for safe implementation of AI.

- **Human-in-the-loop Models:** Companies like Zebra Medical Vision combine traditional analysis and human review

4. Conclusion

The Future of Health Consultation with AI: A New Paradigm Shift Despite significant benefits in most use cases, challenges tied to validation, equity and regulation remain. Maintaining rigorous standards for both clinical effectiveness and ethical deployment will be important to get the most out of AI in healthcare.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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