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AI in Neurology

Artificial intelligence (AI) is becoming an important tool in neurology, helping doctors diagnose and treat brain disorders more effectively. Modern AI systems can analyze brain images, find abnormal areas, and measure changes over time, which helps doctors make faster and more accurate decisions. AI can also simulate different treatment options and predict possible outcomes, improving patient care. In research, AI is helping scientists better understand how the brain works. However, challenges remain, such as ensuring data quality, addressing ethical concerns, and safely applying AI in healthcare. Even with these issues, combining AI with neurology shows great promise for improving diagnosis, treatment, and overall quality of life for patients. The partnership between humans and AI systems is shaping a future of smarter, more efficient neurological healthcare.

Intro and Background

Artificial intelligence (AI) is transforming the field of neurology by improving how neurological disorders are diagnosed, treated, and understood. Using advanced techniques such as machine learning and deep learning, AI systems can analyze large amounts of data—including brain scans, genetic profiles, and patient histories—to detect diseases like Alzheimer's, stroke, and brain tumors at early stages [1]. AI also supports personalized treatment by predicting

patient responses and tailoring therapies to individual needs [2]. In addition, brain-computer interfaces powered by AI allow patients with severe disabilities to interact with their environment more effectively. These technologies reduce the workload on healthcare professionals, improve diagnostic accuracy, and accelerate medical research [3]. Although challenges related to ethics and data quality remain, AI's integration into neurology marks a major step toward more precise, efficient, and compassionate healthcare [4]. (The numbers are references from the source)

Search Strategy

A thorough search was conducted using PubMed with Medical Subject Headings (MeSH) terms such as "artificial intelligence," "neurology," "diffusion tensor imaging," "new technologies," "neurosciences," "neurosurgery," "ChatGPT," and "robotics." These terms were used separately and in combination to find relevant studies.

Eligibility Criteria

Articles published between 2020 and 2022 were included if they discussed both AI and neurology, were in English, and available through open access. Studies not in English, not freely available, or unrelated to both topics were excluded. Out of 70 articles found, 42 met the inclusion criteria.

Selection Process

Duplicate and irrelevant records were removed before screening. After applying inclusion and exclusion criteria, 18 records were excluded, and 6 were removed for being in other languages. The final selection followed the PRISMA guidelines [13], as summarized in Figure 1. (The figure is from the source)

Results

Neurological diseases affect the brain, spinal cord, and nerves, causing many different symptoms depending on which parts of the nervous system are involved. These disorders can result from infections, injuries, lifestyle factors, or environmental causes [14]. Advances in neuroscience and data technology have improved our understanding of the brain's structure and function. Fields such as computational neuroscience and connectomics now use Big Data methods to study complex brain networks [15]. The rise of digital healthcare has also led to tools like clinical decision support systems (CDSSs), which help doctors diagnose and treat diseases more accurately. New technologies such as ChatGPT are further transforming healthcare by integrating AI into diagnosis, treatment, and patient care [16]. (The numbers are references from the source)

Early Diagnosis and Prediction

Early diagnosis is one of the biggest challenges in treating neurological disorders because symptoms are often complex and hard to detect. AI can help by analyzing large amounts of patient data—such as medical history, brain scans, and genetic information—to find subtle signs of disease that doctors might miss [7]. For example, Transcranial Doppler (TCD) ultrasonography is a non-invasive test that uses sound waves to measure blood flow in the brain, providing information other imaging tools cannot [17]. In diseases like Alzheimer's and Parkinson's, AI can detect early changes before symptoms appear, allowing for earlier treatment [19]. AI also improves the interpretation of MRI, CT, and PET scans by identifying abnormalities and tracking brain changes over time, which helps doctors diagnose more accurately and plan better treatments [21]. (Like before, the numbers are references from the source)

Neuroimaging Modalities

Neuroimaging uses techniques like MRI, CT, PET, and SPECT to create detailed images of the brain's structure and activity [22]. These scans help doctors detect abnormalities and understand how different parts of the brain are connected. However, analyzing this data takes time and expertise. AI helps by quickly interpreting brain images, reducing the workload for doctors and improving diagnostic accuracy [23]. In conditions like stroke, AI can rapidly identify damaged brain areas, allowing for faster and more effective treatment [24]. (The numbers are references from the source)

Benefits of AI in Neurology

AI is transforming neurology in many ways. It improves diagnosis by analyzing MRI and CT scans to detect early signs of brain disorders with high accuracy [21]. Machine learning can also predict a person's risk of developing neurological diseases based on genetic and lifestyle data. AI helps create personalized treatment plans by considering each patient's unique characteristics and responses to therapy. Decision-support systems assist doctors with evidence-based recommendations, reducing mistakes and improving outcomes. Additionally, AI manages large amounts of medical data, making information easier to access and organize. In research, AI speeds up drug discovery by identifying promising compounds for neurological conditions. It also enables early detection of diseases like Alzheimer's and Parkinson's by tracking small changes in patient data. Finally, AI-powered telemedicine and wearable devices allow for remote monitoring, giving patients better access to care and reducing hospital visits. (The numbers are references from the source)

Work Cited

Kalani, Meetali. "Revolutionizing Neurology: The Role of Artificial Intelligence in Advancing Diagnosis and Treatment." *PubMed Central*, 5 June 2024, https://pmc.ncbi.nlm.nih.gov/articles/PMC11224934/#REF2. Accessed 30 October 2025.