

The Economics Behind Alzheimer's Diagnosis

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Abstract

This paper discusses the challenges of diagnosing Alzheimer's disease and the extent of its economic impact on the United States. Current diagnosis methods and their limitations are considered, ultimately leading to Artificial Intelligence (AI) being introduced as an alternative solution to provide practical, affordable, and accurate Alzheimer's diagnosis in a timely manner. AI's advantages such as diagnostic accuracy, lower economic cost, and ease of availability are analyzed to propose the technology as the ideal diagnosis method, especially in areas with limited medical resources.

1 Introduction

Alzheimer's disease, the most common type of dementia, is a progressive brain disorder that causes the severe deterioration of neuron networks in the brain. It affects one-third of seniors, with ethnic minorities being disproportionately impacted, according to the Centers for Disease Control and Prevention.. Over the past decade, the rate of positive diagnoses for the terminal condition has grown exponentially, contrasting the sub-linear growth of the number of diagnoses administered by hospitals. Since there is no definitive cure for the disease, patients rely on expensive drugs that only slightly delay the inevitable process of brain degradation. The vast majority of diagnosed patients are older persons who are unlikely to experience any improvements and live for an average of only five years following diagnosis ("What Is Alzheimer's Disease?"). According to

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Jennifer Barnett and her associates at BMC Neurology, “cost-effective early detection and intervention [in the] early stages” of Alzheimer’s is ideal for reducing the financial burden and maximizing the “benefits of a treatment, [regardless] of treatment efficacy.” However, current diagnostic methods require hospitals to purchase and maintain expensive machines, resulting in limited availability and month-long waitlists for diagnoses (Barnett, Jennifer H, et al). Given the inefficiency of current hospital infrastructure and limited financial resources, it is crucial to consider adopting novel technologies such as Artificial Intelligence must be considered as an alternative solution to provide the prospect of affordable early Alzheimer’s diagnosis for patients across the country.

2 Availability of Hospital Infrastructure

According to research interns Jason Weller and Andrew Budson at the University of Boston Medical School, the availability of expensive technologies such as Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) machines is a significant obstacle in achieving faster and more affordable Alzheimer’s diagnosis. These machines are used to scan the brain for weak neuron networks, but they are only available in premier hospitals that can afford regular maintenance and specially trained doctors to operate them (Weller, Jason, and Andrew Budson). This limited availability of technology disproportionately affects rural patients who often do not have access to these machines, resulting in a much lower testing rate and higher mortality rate for Alzheimer’s compared to urban residents, according to researchers Sarah Cross and Haider Warraich at Duke University and Harvard Medical School. Furthermore, the high cost of diagnosis can act as a deterrent towards getting an early diagnosis before significant symptoms show (Cross, Sarah, and Haider Warraich).

The situation is no better in urban areas where demand for diagnosis far exceeds the limitations of current technology, resulting in patients scheduling appointments months in advance. These technologies are often prioritized for emergency services, marginalizing Alzheimer’s despite the known benefits of early diagnosis. According to researchers Jill Rasmussen and Haya Langerman in a study funded by the National Institutes for Health, this lack of prioritization further worsens the impact of Alzheimer’s. The medical industry’s unwillingness to use economic resources for non-emergency-related diagnoses prevents patients from receiving the intensive care required from the earlier stages of the disease

(Rasmussen, Jill, and Haya Langerman).

Despite the crucial need for more medical infrastructure to be built across the country. Since 1991, Ph.D. students Ernst and Hay from the University of Southern California have expressed concerns that the federal government is unlikely to invest in building more medical infrastructure across the country due to the high financial costs involved. Hospitals often lack the resources to purchase and manage expensive machines, especially in rural regions where the limited usage of such technology makes it economically unfeasible. While expanding the range of current industry-standard technology is an apparent option, it is not economically viable. Additionally, as more efficient and effective diagnostic procedures become available, investing extensive federal economic stimulus in building new facilities may not be the most efficient use of resources.

3 A Practical Approach: Integration of Artificial Intelligence

Artificial Intelligence (AI) has emerged as a source of hope for the medical industry, offering a novel technology that can replicate complicated procedures such as diagnoses. According to Robert Sparrow and Joshua Hatherley, researchers at Monash University in Australia, the promise of AI lies in its ability to “improve decision making [and] avoid errors such as misdiagnosis and unnecessary procedures,” all of which is made possible by “increased [procedural and economic] efficiency.” Computers leave little room for error as they follow robotic commands, making diagnoses even more credible. The assurance of more accurate diagnoses is likely to encourage patients to get tested for the disease as a precaution. The practicality of AI extends beyond the accuracy of the technology to its economic efficiency, potentially allowing billions of dollars to be saved in the process. Instead of channeling financial resources towards specialized doctors and the maintenance of expensive technology, they could be spared. This claim is supported by extensive research by Shaker El-Sappagh, an assistant professor at Benha University in Egypt, and his associates. Their study utilizes “Convolutional Neural Networks” to analyze MRI scans, replacing an essential job of doctors. This specific AI algorithm can be used in areas with a shortage of trained medical workers as the procedure is fully automated. Moreover, the versatility of AI allows Alzheimer’s diagnosis to be approached from multiple fronts compared to the standardized system that hospitals cur-

rently follow. The Boston University Medical School conducted an extensive study on the efficacy of AI-produced diagnoses, which confirms the accuracy of these algorithms in real-world settings. The study found that "algorithm model[s] performed slightly better than the average neurologist" - doctors who require decades of training and upwards of 200,000 US Dollars in annual salaries ("AI Algorithm"). Cost-effective algorithms have the potential to revolutionize Alzheimer's diagnosis from an economic standpoint. Other AI algorithms utilize different training data sets or input sources that can function without expensive machinery, providing patients with more accessible and affordable diagnostic options for Alzheimer's disease. According to Rebecca Sohn, a journalist with research roots at New York University, Deep Learning algorithms have been developed by several companies and programmers that can "analyze short voice samples for signs of Alzheimer's," offering an alternative to the expensive and time-consuming procedures of standard Alzheimer's diagnoses. Sohn notes that the adaptability of AI offers numerous other pathways of diagnosing the disease, including a "wearable device that analyzes energy levels". Eran Dayan, an associate of Sohn at the University of North Carolina, Chapel Hill, stresses the central goal of such technologies is to "identify patients as early as possible" to maximize their chances of an "effective treatment." By providing more avenues of standard efficacy for Alzheimer's diagnosis, patients are incentivized to seek early diagnosis, which underlines the importance and benefits of early detection.

4 Conclusion

The increasing prevalence of Alzheimer's disease calls for alternative solutions that can speed up its diagnosis within the healthcare system. Artificial Intelligence offers immense potential for becoming the industry standard due to its versatility, economic efficiency, and widespread availability. By relying on AI algorithms and minimal supportive hardware, instead of expensive physical infrastructure hospitals and patients can significantly reduce the cost of diagnosis, making it a more accessible procedure. AI serves as a bridge between current medical infrastructure and a society where everyone is able to receive an early Alzheimer's diagnosis, maximizing their chances of fighting the disease effectively.

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