

# Analyzing Failures and Challenges in Oncology: Integration of Artificial Intelligence in Healthcare

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## Abstract

*The present study focused on investigating the challenges and failures that had been embarked during the deployment of artificial intelligence technologies within the field of oncology in healthcare. Through precise research and statistical analysis, we aimed to elucidate the specific circumstances surrounding each failure, providing insights into the root causes, consequences, and subsequent developments. The present study was aimed to offer a detailed understanding of the challenges faced through artificial intelligence in healthcare. The primary objectives included identifying common patterns and root causes of the failed tech, assessing the impact on patient care, and exploring potential solutions to mitigate risks and successful integration of artificial intelligence in oncology. The outcomes derived from our study were focused at fostering a more knowledgeable and resilient incorporation of artificial intelligence, emphasizing advancements that prioritize ethical concerns. By doing so, we aspire to catalyze improvements in healthcare outcomes through the conscientious and thoughtful integration of artificial intelligence technologies.*

**Keywords:** artificial intelligence, oncology, challenges, robust, ethical, deployment

## INTRODUCTION

The massive and rapid evolution of technological advancements has brought the imperative use of artificial intelligence (AI) which has become ubiquitous across diverse domains. AI has brought rapid technological growth in the healthcare industry [1]. The technological advancements made by companies such as Microsoft, Google, Apple, and IBM are of great significance to the healthcare sector. In the relentless pursuit of revolutionizing healthcare, the integration of AI into the intricate domain of Oncology has stood as a beam of hope, promising immense advancements in cancer diagnosis and treatment. Currently, AI serves as a burgeoning and swiftly advancing technological paradigm applied across various scientific domains, including those involved in managing cancer patients [2].

Under precision oncology [3], it is undergoing a transformative shift facilitated by AI, as it strives to amalgamate huge data obtained from multi-omics analyses using latest trends in high technological performance computing and groundbreaking deep-learning strategies [4, 5].

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Significantly, the utilization of AI is broadening to encompass novel methods for cancer detection, screening, diagnosis, and classification, as well as the characterization of cancer genomics, analysis of tumor microenvironment, assessment for prognostic and predictive purposes, and development of strategies for drug discovery follow-up [6]. AI techniques could potentially be used to segment tumors and efficiently measure tumors and compare to previous studies in a precise and systematic manner. Efficiency plays a pivotal role in the

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application of imaging in clinical settings, primarily due to the growing demand for radiologists. Even the Response Evaluation Criteria In Solid Tumor (RECIST) [7], utilized for gauging treatment response, are frequently underutilized in clinical practice. This is often attributed to the absence of automation and the needed time and effort required by radiologists to manually measure and systematically compare the findings with previous cases [7].

AI techniques could also be potentially used to identify imaging features that can classify tumors based on tumor features either for improved diagnosis or tumor subtype classification. This has brought a huge technological medical boom for the same.

It can be viewed as a broad concept denoting a machine's capacity to learn and identify patterns and interactions from an ample number of representative examples, and to apply this knowledge to enhance the existing approach to decision-making within a particular domain. Technological developments include surgical robots, lesion imaging, lesion identification, drug discovery, diagnosis, suggestive treatments etc. However, this paradigm shift is not immune to challenges [8].

There have been enormous levels of setbacks and failures encountered in the utilization of AI within oncology. As healthcare crises exacerbate current difficulties, we can reinvent and actualize systems of care and back-office health systems, such as inequitable healthcare access, that there are not enough on-demand healthcare services, high costs, and a lack of price transparency. Cancer ranks among the leading causes of mortality worldwide, emphasizing the critical necessity for early diagnosis to enhance patient outcomes. AI has emerged as a viable tool for diagnosing cancer, by employing machine learning algorithms to analyze extensive datasets for accurate and efficient diagnoses. One of the primary concerns highlighted in the literature is the potential for healthcare professionals to experience de-skilling as a result of diminished autonomy in patient-related decision-making. Consequently, our exploration of challenges and discussions is broadened to include ethical considerations regarding technology and the importance of skills [9].

The potential impact of AI on the fundamental detection of cancer is significant. Nevertheless, it also entails certain disadvantages, such as the requirement for extensive data, technological constraints, and ethical concerns [9]. This overview explores the capabilities and limitations of AI in cancer detection, examining future advancements. By delving into its possibilities for cancer detection, we can gain insights into how AI can enhance patient outcomes and contribute to a reduction in cancer mortality rates [10].

Technological breakthroughs are being adopted slowly. The healthcare practitioners become restless and tired as a result of the physician's knowledge and manual efforts to keep up with the latest information in medicine due to the large amount of data to be collected and used accordingly. AI should be easily programmed and should be taught to physicians so that healthcare simplification and the development of intelligent care systems are made. The COVID-19 issue demonstrates how AI may be used for a variety of purposes, including diagnoses and treatment decision assistance, as well as contact tracing and the deployment of AI-driven technologies. Through facilitating the faster and more precise identification of illness, we could have a complete change in the field of diagnosis of cancer with the help of AI. It can be implemented in many varied areas such as accurately predicting healthcare issues at earliest, using predictive model deployment we can identify healthy system level opportunities etc. [11].

However, several challenges must be addressed before AI can be fully integrated into clinical practice. The primary hurdles will involve the availability and quality of data—AI algorithms require ample high-quality data to effectively learn and produce accurate predictions. Unfortunately, cancer diagnosis frequently lacks consistent data. In order to prevent these, AI algorithms can be trained to examine a variety of patients data sources, such as genetic, medical imaging, and electronic health records in order to spot trends among other things.

Along with AI, other technologies such as Internet of Things (IoT), robotics, machine learning, sensory network [12] has also played various vital roles in healthcare advancements. Under robotic failures there has been enormous failures with respect to robotic malfunctions which included robotic instruments, optical system, robotic arms, and robotic console. There has been a very good success rate of 95% regarding safety and performance of robotic surgery. According to a study conducted in 2016 and published in the journal PloS One, there were a total of 8061 device malfunctions, 1391 patient injuries, and 144 deaths caused by robotic surgery between 2000 and 2013. In 14.7% of the cases that were recorded, the patients were in contact with broken or damaged instrument fragments. There were several devices developed using AI which includes the famous IBM Watson health, ZEUS, AI Chatbots, Linus Health, PathAI, clinical Co-pilot, Freenome and many more. Some of these failed but many showed huge success rates.

AI has developed technological insights under four main oncological categories—lungs, prostate, breast, and brain. The other non-major categories could include skin cancer, stomach etc. The present paper highlighted the challenges and difficulties with cancer treatment, identification of current techniques for solving these difficulties, and ways that AI might impact future approaches.

As discussed earlier, the technological advancements in healthcare includes AI, block chain, machine learning, big data, internet of medical things, cloud computing, virtual reality, nanomedicine, digital therapeutics, genomics telehealth and many more as the developments goes up, the risk and trust among the humans should rise up similarly.

## **REVIEW OF RELEVANT LITERATURE**

AI is the simulation of human intelligence in devices, such as computers or robots, that have been designed to replicate cognitive processes, including learning and problem-solving, that people connect with other human brains. AI is especially concerned with algorithms. There are several uses for AI in the modern era. Another area showing great promise and experiencing rapid growth is the utilization of AI in biomedicine, healthcare, and medical training [13]. It is becoming increasingly important in the modern world. AI enables speedier and more comfortable daily living. AI has advanced significantly in recent years in terms of software algorithms, hardware implementation, and applications in a wide range of fields.

Certain gadgets are capable of performing tasks that normally need human interpretation and judgment. These methods can be used in a variety of sectors, including health and medicine, because of their multidisciplinary approach. Ongoing advancements and innovations will persist in expanding the range and pushing the limits of AI applications, with substantial enhancements anticipated in the foreseeable future. Currently, AI applications are limited to certain tasks or pre-defined solutions. Prominent technology giants such as Google, Microsoft, and IBM are dedicating resources to AI development for healthcare and research purposes. The number of AI start-up companies has continuously increased. Several UK-based corporations have formed partnerships with UK universities and hospitals. NHS providers have forged partnerships with AI developers, including IBM, DeepMind, Babylon Health, and Ultromics [13].

### **AI In Healthcare**

AI-based technologies are becoming increasingly integrated into various aspects of our everyday routines. With AI becoming more pervasive in modern business and daily activities, its utilization in the healthcare sector is also on the rise. AI has been a part of medicine since the 1950s, when doctors started experimenting with computer-aided systems to help them diagnose patients more accurately [14]. AI is increasingly beneficial to the healthcare business and is expected to have a substantial impact in the coming years. The healthcare sector is employing AI to generate diagnoses that are more accurate and prompter compared to those made by humans. AI can aid with diagnosis and alert clinicians to patients' increasing conditions, allowing for timely medical intervention before hospitalization.

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Although AI can execute healthcare duties as well as or better than humans in many cases, implementation issues will impede large-scale automation of healthcare professional positions for a long time [15].

AI and related technologies are increasingly prevalent in both business and society, and their integration into healthcare is beginning to emerge. These advancements hold the promise of transforming various facets of patient care, as well as administrative functions within healthcare providers, insurers, and pharmaceutical firms.

Since AI has become a boon to our society, it also comes with many challenges and obstacles. AI encompasses various scientific disciplines, including statistics and neuroscience, and is currently viewed as a disruptive technology. The classifications of strong and weak AI are also used to further categorize AI technologies. Weak AI applications are continuously being developed and are currently available, such as fraud detection and speech recognition. Since strong AI is not yet available, it is debatable whether or when it will be developed [16]. The healthcare industry is undergoing a revolution.

The evolution in healthcare is propelled by escalating expenses and a deficiency in specialized knowledge. Some believe that if AI helps with diagnosis, treatment, and operations, physicians may become obsolete in the near future.

In order to grasp the potential advantages and challenges of AI in healthcare, it is crucial to initially analyze its function. The healthcare business is implementing innovative IT-based solutions to reduce costs and address growing challenges.

### **IBM's "Watson For Oncology" Theory**

IBM's "Watson for Oncology" is the world's first medical AI. Prior to providing a list of customized, confidence-scored recommendations, Watson parses the input to identify the most crucial pieces of information. It then mines patient data to find information pertinent to the patient's medical and family history. Finally, it looks through the available data sources to form and test hypotheses. Watson may employ notes from medical professionals, electronic medical records, treatment guidelines, research materials, clinical studies, journal articles, and patient data as sources of data for analysis.

Although Watson was created and promoted as a "diagnosis and treatment advisor," she has never really assisted in determining the best course of action for people who have already received a diagnosis. Its cloud-based AI platform allows medical professionals to enter patient data on cancer patients and generate treatment plans based on 12 million pages of medical research, 290 medical journals, 200 textbooks, and a plethora of previous clinical instances. Watson has been utilized in radiology and oncology among other medical fields to evaluate patient data and help physicians diagnose and treat patients. Watson's treatment decisions are believed to be more dependable as more medical staff and Watson agree on management of patient. However, the concordance rates and diagnosis outcomes vary based on presence of particular traits and the type of cancer.

IBM noted that Watson might not produce a high match rate in this regard because of differences in patient ethnicity, disease patterns unique to a given nation, medical systems, and cultural norms. As a result, IBM recommended that the function and accuracy of Watson be improved of AI by gathering more information.

IBM and Manipal Hospitals—a prestigious hospital network in India—announced the introduction of IBM Watson for Oncology on July 29, 2016 [16]. This application helps doctors and cancer patients find individualized, evidence-based cancer care options by giving them information and insights. Manipal Hospitals is the world's second hospital to use this technology and the first to provide patients with an online expert second opinion via their website. This contract was terminated by Manipal in

December 2018. IBM sold off and split off its Watson Health business as Merative in 2022. It is still an independent business as of 2023, with its headquarters located in Ann Arbor and innovation hubs in Hyderabad, Bengaluru, and Chennai. The messiness and intricacy angered the IBM technologists.

Eventually, the oncologists and technologists devised a strategy that leveraged Watson's strength that is, rapidly consuming and reviewing thousands of medical research papers. Watson could occasionally point to other treatments that clinicians may have overlooked by matching references of gene mutations in articles to a patient's genetic profile. It was a potentially valuable new diagnostic tool. It was being sent to various colleges and institutions for further improvement. When it arrived at MD Anderson, they had converted to a new electronic health record system, and Watson was unable to access patient data while also struggling to comprehend doctors' notes and patients' history. Instead of focusing on patient care, physicians grew upset with technology. In certain cases, IBM Watson Health's capabilities may have been overstated, raising expectations that proved difficult to live up to. The discovery that Watson Health's cancer detection tool was trained using fictitious cases submitted by a small group of physicians at a single hospital rather than actual patient data was one of the company's worst defeats. Inadequate accuracy or validation of Watson Health's algorithms may result in inaccurate suggestions or interpretations which acts as the main disadvantage.

There are many such examples; for instance, an algorithm was created to forecast the likelihood of death for hospitalized pneumonia patients. The algorithm methodically categorized asthmatic patients as low-risk. Since asthma patients are frequently admitted to the intensive care unit (ICU) for continuous, intensive treatment, which improves their prognosis and gives the impression that they have a better chance of survival, this calculation was fundamentally erroneous [17]. Another most promising applications of AI which is the detection of skin cancer using a smartphone. But when it comes to non-white skin, every skin cancer detection method under testing today has bias. This was measured for three commercial systems in a recent study. All the systems showed significant performance that decreases between light and dark skin, and none performed better than radiologists.

Another reason medicare has failed with AI in radiology is a lack of trustworthy data [18]. AI algorithms must be educated on enormous volumes of high-quality data before they can be used effectively. However, many of medicare and other healthcare organizations' data sets are fragmented, inconsistent, and incomplete, making it challenging for AI systems to effectively identify and diagnose medical disorders. Moreover, significant privacy concerns regarding the implementation of AI in healthcare have resulted in hesitancy among both patients and clinicians to share medical information.

Despite the potential advantages of AI in healthcare, numerous individuals, including medical professionals, remain unfamiliar with the technology. While some research has demonstrated that AI systems can perform better than human physicians in specific tasks, such as recognizing specific cancer types on medical images, these studies are frequently limited and not frequently repeated. Because of this, many medical professionals are still dubious about advantages of AI and reluctant to use it in their practices. It takes a profound understanding of both computer science and medicine to develop AI algorithms for medical applications, and the process is made even more difficult by the requirement to adhere to numerous rules and guidelines. As a result, AI researchers are facing increased difficulty in developing and promoting their products.

This lack of awareness can be a major challenge in the use of AI technologies in healthcare settings. The majority of hospitals lack graphic processing unit (GPU) computers, and Health Insurance Portability and Accountability Act of 1996 (HIPAA) laws; these security specifications make it difficult to send photos to the cloud. Integrating electronic health record (EHR) and imaging data is challenging because they are stored on different systems. Every institution has a different series description convention and coding scheme for medical photographs. Despite efforts to standardize these practices, an often-overlooked difficulty is routing the necessary photos to the appropriate AI models. These days,

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AI models are limited to working with extremely particular image types, such as contrast-enhanced abdominal computed tomography scan (CT), diffusion-weighted brain magnetic resonance imaging (MRI), and frontal chest X-ray. The majority of models are likewise restricted to a specific range of scanner settings. Picture DICOM metadata is a very imperfect guide to understand what is in a picture and how it was acquired due to the carelessness of overworked technicians, making image routing a difficult and challenging task.

Many firms now offer healthcare solutions and services based on AI technology. In addition to aiding medical professionals, certain medical robots also benefit patients. Furthermore, exoskeleton robots, for example, can assist those who are paralyzed in regaining their capacity to walk and become independent. The employment of this technology in smart prosthetics is one example. AI and machine learning advancements are transforming prosthetic technology by utilizing sensors and internal sources within the limb to gather external data from the environment. This enables the prosthesis to respond to its surroundings more organically and make real-time adjustments [19].

The AI-powered stethoscope is another example. This AI-powered digital stethoscope is helpful for anyone working in the medical field because it can automatically provide diagnostic results and provide digital audio records for further study. Unlike conventional stethoscopes, readings can be obtained even in noisy surroundings, enabling more precise diagnoses. Anyone can obtain the records and telemeter them to the doctor because the digital device doesn't require any special skills to operate. Furthermore, this lowers their chance of contracting COVID-19 and makes it easier to provide better healthcare to the patients who are chronically sick and live in distant areas. Since blood flowing around a blood clot in blood vessels is different from blood flowing through regular arteries, the same idea applies here.

Due to AI and machine learning, computers can now identify patterns and abnormalities in diseases within vast amounts of clinical data.

## **PROPOSED WORK**

AI has been a remarkable technological development over the years and has drastically helped every industry thereof. Looking over the past surveys, the healthcare industry has shown a good amount of growth over the same. They have shown many technological developments in the Department of Oncology.

The Oncology department is a medical specialty focused on diagnosing and treating cancer. This encompasses medical oncology, which involves the utilization of chemotherapy, therapies, and medications for cancer treatment. It also includes radiation oncology which uses radiation to treat cancer. Both the Oncology have shown better results when integrated into comprehensive cancer care plans.

The key areas of application are clinical decision, drug discovery and development, population health management, health data analytics, and imaging analytics.

The failures and challenges in the field included incomplete, inaccurate, and inconsistent data, object misidentification, misdiagnosis, software corruptions, program glitches, lack of trust etc. These factors led to limited use of AI.

We delve into the complexities surrounding AI failures in healthcare, aiming to not only identify the root causes but also propose strategic solutions. By directly acknowledging and dealing with these challenges, we can unlock the complete capabilities of AI while guaranteeing patient safety and trustworthiness of healthcare procedures.

At the heart of the issue lies the need for a multifaceted response that combines technological refinement, ethical considerations and collaboration among stakeholders. By conducting thorough analysis of training data quality and algorithmic transparency, we can identify and rectify the biases and deficiencies that contribute to AI failures. Moreover, the incorporation of human oversight and continuous monitoring mechanisms can act as crucial safeguards, ensuring that AI applications align with the highest standards of patient care.

Also, there has been technological advancements such as Bigdata, MongoDB, Tableau, Google data analytics, and many other cloud databases. To get accurate data we can use tools to quantify and qualify the collected data, using smart, integrated data analytics etc. Also, we need to make sure the doctors and nurses or any person who handles the technological instrument must know how to use the same. In most cases, the doctors become tired of using it and feels to return to traditional methods.

Regular validating and updating the algorithms is necessary to ensure accuracy and effectiveness over the software as the data gets updated technology day by day. By resolving interoperability issues, which involve timely and secure access, integration, and utilization of electronic health data to enhance health outcomes for individuals and populations, we can facilitate smoother integration into current healthcare systems. Clinicians must be involved in the development and testing processes to ensure practical relevance of knowledges of this technology. The regulatory approval process must be tracked and streamlined to facilitate faster implementation.

Medical facilities are not available throughout the world. The poor people are inadequate to health facilities and are prone to not using medical cares. In such cases, the technical developments should be able to help the people in those areas. Using huge ChatBots in a clinic can make people walk in for free medical cares and issues, sending medical robots in places where medical camps occur to get data. These data can later be used to develop efficient ChatBots.

Introducing software with the goal of informing the user about the place where the medicines can be found. It is not just the names of medical shop, but rare medicines also. This could make people aware about the places where rare medicines could be found and whom to contact for the same. Creating software which can help people who need immediate blood donors by providing information on the details of blood donors in their respective areas. Same could go for organ donation and any other medical things.

Providing virtual reality care for people who need it; for example, Alzheimer people may need a device which can take them to their homes, if they are lost. Patients of post-traumatic stress disorder (PTSD), dementia, and movement disorders could also be benefitted using this approach.

The developers and doctors should make sure they are open to their patients, they must tend to maintain transparent communication about the system's capabilities, improvements, and any identified challenges. It is also necessary to use the AI tools only in the specified areas and not in any out of the scope areas so that it can deliver the most value and impact. Often include various unbiased choices so that the symptoms can be judged correctly and necessary medicines can be given. For example, if a ChatBot is being asked about a diagnosis the app should be built in such a way that there are many variations of questions so that necessary symptoms can be checked and matched with diagnosis.

When corporations manufacture surgical robots, the most important thing to consider is if the goods are of high quality, as most mistakes are made in the robot's parts, which can lead to surgical blunders. It should be ensured that the parts are fixed properly and tightly. Software such as Rampvision can make imaging and identifications of lesion most accurate.

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Developing AI tools such as IBM Watson Health should make sure about the data given in the backend; it should include all simplest symptoms with correct diagnosis. The focus of the software can be on specific cases where it can demonstrate measurable value. Also, providing comprehensive training and support for healthcare professions for using the software can maximize its benefits. It is essential to adopt approaches to tackle biases present in data and algorithms, ensuring equitable and impartial outcomes.

It should be ensured that the patients are also fully aware about AI being implemented in healthcare. Lack of trust over the AI implementation in healthcare could also be a huge blackmark as it is not a technical failure. We should also focus upon patients' privacy and security. There should be strong measures to ensure patient data and privacy. The security should comply with data protection regulations and industry standards to build trust among patient and healthcare providers.

We can also try to bring back the lost projects under AI over healthcare, which may now be redeveloped; this could be more helpful with respect to future prospects. The challenges and failures made in the past should be kept in mind and necessary measures should be worked out. The errors that occurred can be corrected and precautions can be taken to avoid repetition of such mistakes. Engaging the youth in the process could make them feel more valuable and morale towards their working skills.

## CONCLUSION

As AI becomes increasingly prevalent in modern business and everyday activities, its integration into the healthcare sector is slowly progressing. Healthcare providers stand to gain various advantages from AI, encompassing both patient care and administrative tasks. Although many AI advancements in healthcare are advantageous, the methodologies they endorse may vary considerably. Applications of AI and associated technologies are becoming more and more common; businesses cannot ignore this trend or fail to take use of it to gain a competitive edge. The revolutionary potential of AI makes the healthcare sector particularly open to novel applications. AI applications are transforming not only the way that healthcare is delivered in terms of diagnosis and treatment plans, but also the way that patients live their lives, since healthy lifestyles are essential to their overall well-being. Even with these notable advancements, AI application in healthcare is still very much in its infancy. Future years will see further breakthroughs in a range of industries as a result of ongoing research that will expand the technology's potential.

The results of the present study indicated that the success or failure of an AI project is influenced by a number of technological and non-technological elements. The significance of differentiating between general obstacles and crucial success and failure elements of AI initiatives has been highlighted in the present research. While certain failure reasons are difficult to predict and control, it is simple to determine in advance the significance of other usual elements for a given company. When AI is used to its full potential in cancer detection and treatment, patient outcomes and survival rates will improve. To do this, we must maintain our investment in R&D, work across disciplines, set standards and norms, teach and prepare researchers and physicians, and guarantee the development and application of AI in a way that is morally and fairly correct. In addition to highlighting important ideas in the literature, this systematic review of the literature also points out significant gaps in the study on AI in healthcare, including advantages, adoption hurdles, and privacy and safety concerns.

The conceptual and design papers—which have little to no testing—are the focus of the article in this paper review. Large-scale testing of the suggested systems and frameworks in actual environments should be the main goal of future research. Since the main obstacle to public acceptance is the fear of data leaks, future research should concentrate on enhancing the security and privacy of IoT devices that monitor and store patient data. This will contribute to offering more complex perspectives on how innovations such as AI might enhance healthcare globally.

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