RESEARCH ARTICLE

ENHANCING PATIENT CARE WITH AI AND RPA: PREDICTIVE ANALYTICS FOR IMPROVED REAL-TIME MONITORING

*[1]Kamala Venigandla, [2]Venkata Manoj Tatikonda and [3]Naveen Vemuri

[1]Masters in Computer Applications, Osmania University, Cumming, GA; [2]Masters in Computer Science, Silicon Valley University, Dallas, Tx; [3]Masters in Computer Science, Silicon Valley University, Bentonville, AR

ARTICLE INFO

ABSTRACT

Artificial intelligence (AI) and robotic process automation (RPA) amalgamation has caused a dramatic change in healthcare in the areas of predictive analytics and real time monitoring. This paper examines the various impact of implementation AI and RPA systems on the quality of patient's care and the workflows of clinical settings in healthcare. We start by doing a detailed analysis of AI and RPA in the healthcare industry. Subsequently, we continue to explore the revolutionary role of these technologies in the process of managing patients. AI and RPA can be used to develop and improve workflow systems, which in turn can lead to higher efficiency, better quality of the care, and can be applied in numerous fields such as clinical decision support, and administrative tasks. Subsequently, we illuminate the paradigm of predictive analytics in healthcare, highlighting its priceless role in the prediction of patient outcomes, identification of patients in at-risk populations, and the development of treatment plans that are tailored to each individual. Achieving this goal is enabled by the process of using modern statistical algorithms and machine learning techniques. As a result, the healthcare providers are enabled to foresee the development of diseases, detect the abnormalities and take preventive measures. Then we will have a look at the amazing global of the real-time monitoring using AI and RPA. This kind of up-to-date technology provides a continuous monitoring of patient health parameters and an immediate response when it is needed. With the help of real-time data from multiple sources, monitoring systems that run on AI technology have the potential to detect any slight differences in a patient's condition, even if they are not obvious. Such systems allow them to foresee problems and warn doctors about imminent risks and adverse events before they happen. Also, we give an overview of the benefits and difficulties of AI and RPA integration in the healthcare system. Although these technologies help to bring about better outcomes for patients, greater efficiency, and cost savings, there are also difficulties in terms of data quality, privacy issues, and ethical considerations. Lastly, we go further into the future outlook of the discipline that is consisting of the AI model advancement, the internet of things integration and the ethical systems creation. Through the adoption of the trends in AI and RPA, healthcare institutions can leverage the power of the technologies in shaping the innovative cloth of healthcare, improving the patient outcomes and promoting the patient-oriented care.

INTRODUCTION

Over the last couple of years, AI and RPA has been a major driver of advancements in the healthcare sector. Here innovation has been flourishing at an accelerated pace. The Artificial Intelligence (AI) include several technologies like robotics, natural language processing, machine learning, and computer vision. These technologies provide the help in more than one healthcare fields [1]. And RPA tools are a set of methods intended to perform work more effectively by concentrating on the areas where an employee works on daily tasks [2]. There joined collaboration has brought a major change to healthcare that manifests itself primarily as the new and better approach to patient care monitoring and management. Through blending the predictive analytics with AI and RPA tools, the healthcare sector has considerable prospects for providing better real-time monitoring, anticipating patient's needs, and making timely actions. It has effected the patient care in its own revolutionary transformation.

Global healthcare systems are facing a plethora of challenges, including the fact that medical expenditures are consistently on the rise, the number of elderly people is increasing every day, and the number of chronic diseases is rising fast. In this fast-paced evolution, the requirement of healthcare solutions that are efficient, cost-effective and addresses the patients' needs has become critical. Healthcare AI and RPA are bringing to the table an array of prospects to overcome these issues through data-driven insights, automating repetitive tasks, and streamlining clinical workflows. The importance of Robotic Process Automation (RPA) is in automating administrative tasks, or scientific or industrial works. The robotics transcends the techniques of robotics involving the robotics as the automata (robots) to perform different tasks in place of humans [3]. In simple terms RPA means automation of service functions, which can be used as a form of human labor substitute [4]. In addition to this RPA would be able to do not only the regular tasks which are simple however, they take time. Tasks such as logging in into applications, copy and paste data, open emails, filling out forms as well as a lot of others [5].
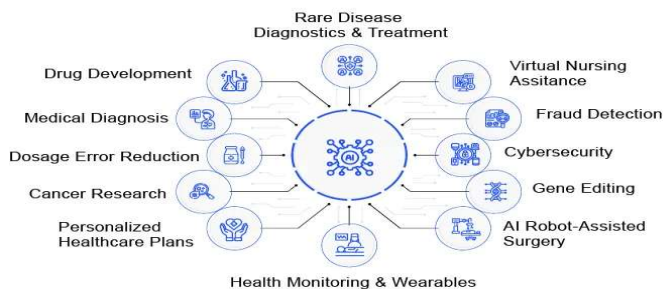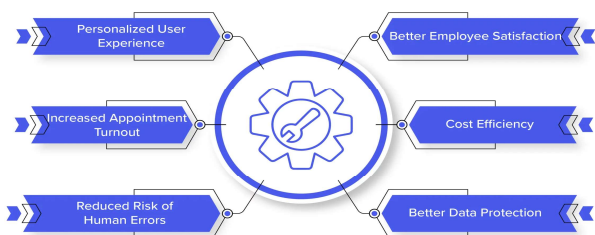
Figure 1. AI in Health Care

Figure 2. RPA in Healthcare

The purpose of this paper is to investigate the different effects of utilization of AI and RPA technologies for real-time patient monitoring in healthcare facilities, taking into account that they are predictive analytics. The purpose of this essay is to conduct a thorough analysis of the usage of these technologies, their applications, benefits, challenges, and future directions. Consequently, the reader will have a deep understanding of how they are changing and improving the delivery of healthcare and the end results. As we commence to experience this pioneering stage, it should be acknowledged that AI can be an impressive force in revolutionizing healthcare delivery models. They have a vast range of applications that affect all aspects of healthcare; they can improve diagnostic accuracy, treatment efficiency, and in some instances, even cure diseases. Although a brighter side is also visible, these innovative technologies also have some challenges which need to be addressed to bring the best of them in healthcare. Some of those are tackling the data privacy problems, handling the regulatory complexities, and sensitive ethical issues. While the AI and RPA transformation in healthcare is progressing, we are also facing various challenges. Successful management of these challenges is the only way to tap the full potential of AI and RPA in healthcare. In this paper we are going to look into the intricacies of AI and RPA in healthcare, relying on evidence to show how they affect predictive analytics, real time monitoring and other areas. The objective of the review will be achieved by a thorough examination of literature, case studies, and expert opinions. Then, the paper will present a clear picture of the technologies and offer practical recommendations. Having knowledge of the AI and RPA in healthcare we can explore promising applications for patients, efficiency of healthcare services and clinical outcomes and we will be able to find out what will be the future of healthcare.

AI and RPA in Healthcare

The merger of AI and RPA in the healthcare is making a revolution in the way that care and management of the patients is delivered. AI specialist provides the skill-sets in machine learning algorithms and natural language processing, which enhance the systems to effectively analyze enormous chunk of data, which is then used to aid in decision-making. Through RPA, tasks that are automated free up the time of healthcare professionals for more demanding matters of care thus improving the quality of care. These technologies involve a variety of

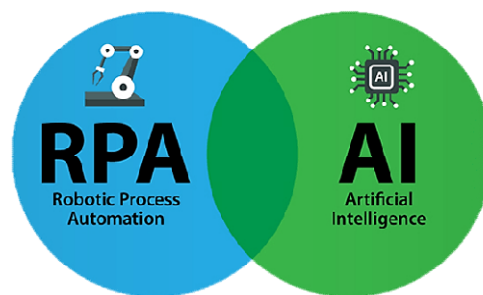uses in clinical decision support, diagnostics, administrative work and patient care.

Figure 3. AI and RPA in Healthcare

AI-enabled chabots and virtual assistants are able to process a huge number of patient requests and appointment scheduling issues. RPA is also a good fit for automation of administrative tasks like billing and claims. Although machines won't supersede human surgeons, AI can potentially make the most effective and efficient decisions. However, AI is now able to do more than just improve the medical imaging field; it can replace human decision-making in some cases [6]. This collaborative effort will improve the operational efficiency and bring down the costs of service delivery, hence increasing the capabilities of human beings that will in turn lead to better outcomes for patients. However, the way that this technology is widely used cannot be overlooked as it possesses serious ethical, legal, and privacy challenges. The solution of these questions is very important to make sure that AI and RPA are used right and fairly in healthcare. Even though we are facing the challenges, the synergy between AI and RPA is powerful enough to transform healthcare industry, and to come up with the ground-breaking solutions to make the patient care faster and much better.

Predictive Analytics in Healthcare

Using state of the art algorithms for statistics and artificial intelligence is one of the key factors for predictive analytics in healthcare. Through the use of data-driven models, it will enable forecasting of patient outcomes, identification of at-risk populations, and improvement of treatment strategies. The issue of data integration in healthcare is a key one, since it refers to the process of bringing patient data from different systems to one unified solution. This allows doctors to have an immediate access to data and ensure the availability of a wide range of information to ensure patients get the best care [7]. Furthermore, the fact that I was away from my friends and family also added to my stress. A portion of the data is encrypted and due to patient data confidentiality, access is limited. Moreover, there are devices and medical equipment that are not compatible with each other, thus they do not share data [8]. However, with the use of data analysis, we can do more than just analyze the past information about patients, demographics, or clinical parameters, predictive models have the ability to foresee the disease progression, detect anomalies, and intervene early.
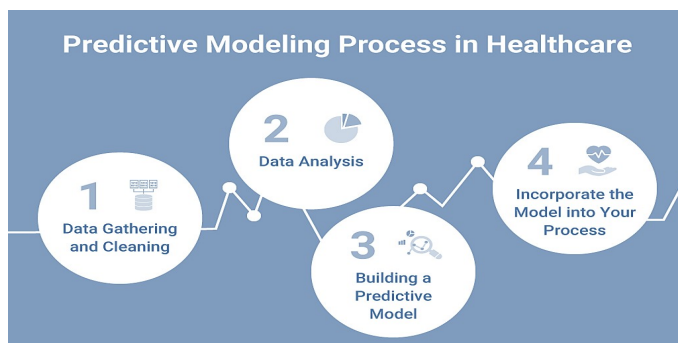

Figure 4. Predictive Model

These models make it possible for healthcare providers to allocate patients into risk categories, individualize treatment plans and resource utilization, and improve overall efficiency. Healthcare predictive analytics is a valuable instrument indeed. It helps healthcare providers to identify patients who can readily be re-admitted to the hospital or those at the high risk of complications. In this way, these treatments and preventative measures can be put forward to enhance the patient's clinical outcome. Through the use of the health systems, it becomes possible for the development of the specific predictive models that are used to assess the probability of patient failing to show up for their scheduled appointments. This may result in better management of patients, decreased wastage of resources as well as improved efficiency in the utilization of resources [9]. Also, real-time monitoring is impossible without predictive analytics because it enables constant patient tracking and, in turn, early detection of any significant health deterioration. By means of the linking up of AI-based monitoring and wearable devices, healthcare providers can get warning from predictive models regarding potential problems. This process gives a chance to do things fast and in advance, thus improving patient care. However, the health care industry is dependent on well-established data governance, data interoperability, and clinical systems integration when adopting predictive analytics. It is equally important to consider the ethical concerns of data privacy and patient consent as we strive to develop the use of predictive models in clinical practice.

Real-Time Monitoring with AI and RPA: The use of AI and RPA in real-time monitoring in healthcare has completely changed the game, giving the ability to monitor the vital parameters of patients continuously and quickly. Tracking actual patient condition and utilizing forecast analytics for the diagnosis of diseases and prevention of them have turned into vital issues in healthcare. These innovations enable doctors to screen for health disorders and diagnose them early enough to stop them from becoming serious [10]. AI-driven monitoring systems have next generation machine learning algorithms that can go through the data in real time, and they do that from a variety of sources, such as EHRs, medical devices, and wearable sensors.

Figure 5. Real Time Monitoring With AI and RPA

With the use of these systems, one can detect the most accurate signs of a patient's condition, imagine what possible complications can be, and therefore, the physician will have enough time to act properly. AI and RPA can conduct data processing including collection, aggregation, and analysis with high speed and effectiveness, this will enable timely response to any eventuality. Monitoring the healthcare area with data streaming is one of the key points of the healthcare system. By this, real time data of the patient's health can be taken [11]. RPA is used for doing the jobs of entering data, getting reports, and setting alarms which in turn allow for the faster analysis of the data resulting in quicker decision making. Healthcare workers can in this case greatly contribute to the research of this technique as it permits them to filter information and insights which are the most recent. Combination of AI and RPA technologies is one of the main advantages of these technologies that make them possible to be used in real-time predictive analytical systems.

Data streaming may be regarded as a very helpful tool in the implementation of a trend detection algorithm in the patient data which may provide an early sign of the symptoms of a complication developing [12]. This setup is a scenario that allows the healthcare providers to predict the patient needs accurately and to prevent the unwanted consequences by acting ahead of time. However, the real time health data monitoring is another mechanism whereby the patient's health condition could be monitored to trigger alerts if the health condition starts to worsen [13]. Artificial intelligence and Robotic Process Automation can be the tools of healthcare facilities to be able to supervise the safety of the patients. The alarm here could be an indication to the medical personnel on who and how to respond in time [14]. This aim is to maximally optimize the clinical outcomes, and to do so in a way that will allow for the rational use of resources in both the stable and the unstable environments.

Benefits and Challenges: The combination of AI and RPA in healthcare for predictive analytics and real-time monitoring brings along a number of benefits; on the other hand, these technologies are accompanied by the emerging distinctive problems.

Benefits

Enhanced Patient Outcomes: Using predictive analytics and real time monitoring, health problems will be detected earlier, and the immediate interventions that will save patients' lives will take place.

Increased Efficiency: RPA robots can do repetitive tasks that are, as a result, the workflow gets better and the healthcare professionals will be less absorbed in the routine and have more room to be patient-centered.

Cost Savings: AI and RPA applications empower healthcare system to do more with fewer resources as well as to reduce waste and to prevent adverse events, this consequently results in significant cost decrease.

Personalized Care: Using predictive analytics, the treatment can be tailored to suit each patient with respect to the individual characteristics and risk profile of the patient that in turn lead to the implementation of only targeted interventions which are effective. Bringing data intelligence in real-time monitoring, AI makes it possible to have decision making evidence-based and therefore lives can be saved and the resources utilized will be improved.

Challenges:

Data Quality and Integration: Data accuracy, completeness, and interoperability of transmitting across dissimilar systems are the most daunting obstacles facing the applications of RPA and AI in healthcare.

Privacy and Security Concerns: The use of the data of the patients who are vulnerable for predictive analytics and real-time monitoring creates issues of data breach and privacy. Given the nature of personal health data, security needs to be the top priority.

Ethical Considerations: Ethical issues should be taken very seriously for the reason that AI and RPA must be used in healthcare in a fair and ethical manner. The other aspect that is to be considered is the idea of algorithmic bias, transparency, and accountability.

Workflow Integration: It is not an easy task to add AI and RPA into the clinical workflow that is now working smoothly, this should be done taking the user acceptance, training, and change management into consideration among others.

Regulatory Compliance: Integration of AI or RPA into clinical settings is likely to be achieved through observing the regulatory rules and norms like FDA approvals for AI algorithms or data protection regulations. As a result, such challenges occur when AI and RPA are introduced to healthcare settings.

Nevertheless, it is important to also highlight the issues that may develop with healthcare data streaming, such as others. The above problems include data security and privacy issues, interoperability, data quality, regulations, and data infrastructure, and data governance [15]. AI and RPA are relatively new things, and to harvest the best out of them, healthcare organizations will have to face some challenges concerning their implementation and usage.

CONCLUSION

As a final note, the introduction of AI and RPA in healthcare field is a breakthrough development that will influence dramatically the administration of patient care. The survey aimed at AI and RPA in healthcare was the first. It showed that such technologies can simplify some routine procedures, accelerate productivity, and lift the quality of healthcare in different areas, for example, clinical decision support and office routine. AI algorithms that can make forecasts are growing in importance in healthcare, and that is due to the power of predictive analytics in healthcare. The algorithms in turn assist healthcare professionals to make predictions about patient outcomes, identify patients at risk and in turn help to develop individualized treatment strategies. Through the integration of AI, RPA, and predictive analytics, the preventative measures can be taken to improve the clinical outcomes and satisfaction level of clients. Through AI and RPA, real time monitoring becomes possible which makes it possible to observe patient health parameters and to act promptly and to manage proactively the care of the patient. The artificial intelligence (AI) technology brings about the effectiveness of systems for monitoring by providing real-time data analysis of a patient's condition even when there are little changes or fluctuations. This opportunity allows healthcare providers to act fast to resolve any arising concerns and therefore puts first the safety and general well-being of the patient. Despite of the fact that there are vital benefits in the adoption of AI and RPA in healthcare, there are as well notable difficulties that are associated with it. The adoption of digital and data technologies by countries in the agricultural sector comes with a responsibility to use them responsibly and fairly. This means having solid governance frameworks and regulatory compliance measures to address issues regarding data quality, privacy concerns and ethics. In the context of future AI and RPA in healthcare domain, the development of AI algorithms, the use of IoT devices, and the introduction of ethical guidelines will be seen to be ongoing. These trends will specifically improve predictive analytics capabilities and real-time monitoring, and will also lead to innovation in healthcare delivery. In short, AI and RPA in medicine should not be concealed. Through a complete adoption of these technologies and a prompt response to the emerging challenges, healthcare organizations can help to fully benefit the offered precious technologies. Consequently, this would lead to better outcomes of patient care, increased operation efficiency and finally, the healthcare system would be transformed into the one which is patient-centered and sustainable.

Future Directions: Healthcare analysis and the real-time monitoring that is coming up will be one of the AI and RPA aspects that are very important. It will be a different face of healthcare as we know it and the way treatment and care is offered will eventually be influenced by such shifts.

Advancements in AI Algorithms: Algorithms of AI in the future will have higher and higher accuracy, and predictive models and real-time monitoring systems will be extremely useful for processing large amounts of data.

IoT Devices: The coming into being of IoT devices and as well as the integration of AI and RPA solutions into the system results in an effective and coherent integration. The latter is the factor that could easily lead to a new era of remote patient monitoring and personalized medical provision.

Enhanced Interpretability: Actions to increase data interoperability and standardization are key to the tearing down of data exchange barriers between healthcare systems, making way for this patient to be widely and efficiently monitored and analyzed.

Ethical AI Frameworks: It is a priority of the ethical AI frameworks and guidelines to ensure sensible and transparent employment of AI and RPA in the healthcare system. They will be focused on such factors as the neutrality, fairness, and transparency of AI technologies, hence ensuring that they are used ethically.

Predictive Analytics for Population Health: Identifying the skill of AI expert, predicting health population at risk will be the key to the operation of the population health. Hence, it allows the health care institutions to do the following: identify at-risk populations, implement prevention measures, and utilize resources in the most efficient way possible.

Telehealth and Remote Monitoring: The rise of telehealth services and the remote monitoring devices will be rendered more possible by using AI and RPA for real-time monitoring. This is the situation where chronic diseases will be well controlled and healthcare services will be accessible to many people.

Augmented Intelligence: There is an increasing acceptance of the idea that the inclusion of human expertise along with AI solutions can be beneficial in healthcare. The achievement of the aim herein would be a powerful tool that is at the hands of the healthcare practitioners and therefore it will enable them to make better choices and get better results.

Regulatory Frameworks: The ongoing procedure of creating regulatory regime for AI and RPA in healthcare is a crucial part which helps to provide clarity for healthcare organizations and ensures their compliance with the guidelines and best practice. The knowledge gained through the use of AI and RPA technologies, healthcare organizations, will have a clear understanding of how to provide the highest quality of care and achieve the best patient outcomes. In addition, the foundation to the cutting edge of healthcare innovations could be elevated.

REFERENCES

"Infopédia (2020). Dicionário Infopédia da Língua Portuguesa, 2020. [Online]. Available from : https://www.infopedia.pt.".

A. &. H. G. Asquith, "Let the robots do it!–Taking a look at Robotic Process Automation and its potential application in digital forensics.," Forensic Science International: Reports, 1, 100007., 2019.

A. &. M. K. Bohr, "The rise of artificial intelligence in healthcare applications. In Artificial Intelligence in healthcare," *Academic Press.,* pp. (pp. 25-60). , 2020.

A. W. K. &. L. W. Wong, "Big data analytics in healthcare: promise and potential. *Health information science and systems,"* pp. 8(1), 1-8., 2020.

B. &. F. C. Gance-Cleveland, "Virtual visits and remote monitoring of children with medical complexity," *Journal of Pediatric Health Care,* pp. 32(1), 7-15. , 2018.

D. C. A. Alexandru, "Big Data in Healthcare and Medical Applications in Romania," in IEEE International Conference on Automation , Quality and Testing, Robotics, THETA 20th edition, 2016., 2016.

G. S. M. S. a. P. B. P. Karthick, "Internet of things in animal healthcare (IoTAH): review of recent advancements in architecture, sensing technologies and real-time monitoring.," SN Computer Science 1, pp. 1-16, 2020.

H. A. &. L. J. Park, "Real-time big data processing for remote patient monitoring in mobile health.," *Journal of medical systems*, 43(6), 130., 2019.

H. L. L. T., "Promises and Challenges of Big Data Computing in Health Sciences," in Big Data Research vol. 2, 2015, pp. pp 2-11.

K. D. P. &. N. T. Kotecha, "Continuous quality improvement in healthcare: a critical analysis.," *Journal of Health Organization and Management,* pp. 33(5), 564-574., 2019.

K. Roney, "If Interoperability is the Future of Healthcare, What's the Delay?," Becker's Hospital Review, 2012.

L. K. T. A. B. Yichuan Wang, "Big data Analytics: Understanding its capabilities and potential benefits for healthcare organizations," In Press Article," Technology forecasting & social change", Science Direct, Elsevier, 2016.

S. &. R. A. Aguirre, "Automation of a Business Process Using Robotic Process Automation (RPA)," Available from: https://www.researchgate.net/publication/319343356_Automation, Vols. A Case Study. 65-71., no. DOI: 10.1007/978-3-319-66963-2_7. , 2017.

V.-D. C.-M. L. a. G. W. N. Ta, "Big data stream computing in healthcare realtime analytics," in IEEE international conference on cloud computing and big data analysis (ICCCBDA)., 2016.

W. M. B. M. &. H. A. van der Aalst, "Robotic Process Automation.," 2018, p. pp.269–272.

****