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Analyze how data analytics helps manage chronic diseases like diabetes and hypertension through continuous monitoring and personalized care plans.

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Abstract

Background: Non-communicable diseases are today's leading killer diseases since they are a common cause of morbidity and mortality as well as contribute to high health costs. These conditions thus have to be continuously managed, and the patient assigned a correct treatment plan to reduce possible complications and enhance the quality of life. Data analysis in the healthcare sector offer novel ways of disease surveillance in real-time and developing unique approaches to health intervention.

Aim: The purpose of the current investigation is to examine the effectiveness of 'big data' solutions to the existing healthcare issues of diabetes and hypertension in relation to their monitoring, care plans, and program prognoses.

Methods: The data used in the study include physiological, lifestyle, and behavioural data from wearable devices, EHRs, as well as health applications. Data mining tools also include use of machine learning and predictive analytics used to monitor patient data in real time with a view of customizing treatment plans. Real-time monitoring systems give feedback to both patients and health care providers for necessary modifications in treatment plans in the course of the treatment.

Results: The usage of data analytics enhances the ability of monitoring the essential health standards inclusive of blood glucose levels as well as the blood pressure to detect health risks and disease flare-ups. Individual care maps, which are developed according to patient characters, increase compliance to treatments and self-care, as well as prevent readmissions and long-term complications or comorbidities. Predictive analytics in this context can provide the necessary intelligence for what is to be expected regarding the progression of a disease so that appropriate action can be taken by the health care providers.

Conclusion: It also supports the efficient treatment of such conditions as diabetes and hypertension via timely data tracking, patient-specific solutions, and forecasts. They result in enhanced patient experiences, better functioning of the health systems and more preventive and effective method to managing chronic illnesses, among others. Future technologies of AI and telemedicine are likely to bring more benefits in achieving the above-mentioned objectives.

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Keywords: data analytics, diabetes management, hypertension, personalized care, continuous monitoring, predictive analytics, chronic disease management, healthcare

Introduction

Diabetes and hypertension are some of the most common and expensive disease conditions in the global health index. Unfortunately, these diseases are chronic diseases and therefore entail a long term treatment and not just curative measures. Diabetes is a disease where the body either fails to make enough insulin or if it does, it cannot use it effectively thus resulting to high blood sugar levels. Hypertension or high blood pressure is a medical condition where the blood pressure is abnormally high and constantly exerting pressure on the walls of the arteries; high blood pressure is a dangerous condition that puts the patient at risk for a number of life-threatening diseases including heart diseases, stroke and kidney failure. Some of the conditions that are often associated with hypertension are also related to diabetes, and most of the diabetic patients are often at a higher risk of developing hypertension. Altogether, these diseases cause a two-fold problem for the peoples and the economies of countries and healthcare systems [1].

Worldwide, the prevalence of chronic diseases is increasing and this can mainly be attributed to elements like increased life expectancy, lack of exercise, poor diet and also high incidences of obesity. According to the World Health Organisation, non-communicable diseases are the leading cause of death and constitute 71 per cent of deaths in the world today, including deaths due to diabetes and hypertension. From this big number of deaths, diabetes and cardiovascular diseases which are associated with hypertension stand out strongly. The rate of diabetes only; the IDF has estimated total 537 million people are suffering from diabetes globally in 2021 and it will be 643 million in 2030. Likewise, hypertension estimated to be around 1. 127 million adults with diabetes aged 30 years and above around the world according to the WHO despite the fact that close to half of the 420 million global counts are managing the disease poorly [2].

These chronic diseases have a heavy toll on people's pocket. Diabetes and hypertension entail additional health expenses for those resulting from medications, regular checkups, and hospitalization In addition, diabetes and hypertension are associated with other costs from being off from work or being incapacitated due to the diseases as well as early deaths. This was according to the statistics that indicated that in United States alone $327 billion had been spent on total medical expenses, loss of work and wages for people who had been diagnosed with diabetes in 2017. High blood pressure also has huge economic implications: direct and indirect costs of hypertension in the U. S. alone are more than $131 billion per year. The chronic diseases follow a similar pathway whereby in low and middle-income countries most of which have a weak health care system the burden of diseases amplifies poverty and reduces the ability of the patients to seek for health care [3].

This therefore calls for constant monitoring of the patient's condition and having to come up with patient-specific care plans to manage the risk factors and complications associated with the illness.

Diabetes and hypertension among other chronic diseases are complicated hence need to be managed by considering various factors. Organizational management practices are common for handling illnesses and entail quarterly check-ups in which the doctor assesses a patient's status, prescribes medication, and changes doses. Still, this kind of pattern may not work effectively because the interventions are given only when the client is seen in a follow-up appointment when he/she is already deteriorating. Often, people are able to suffer high blood pressure or high blood sugar levels and manage with simple

medications or at least, without medical supervision in the short term, which can cause severe and many a times, life threatening conditions in the long run. In addition, there is a tendency of medical practice to adopt a homogeneous approach to the problem by treating all peoples that have the disease with the same dose of medicines and dieting routines that are devoid of the recognition of variation in progress of the disease, risk factors and variations in response to the medications [4].

This is why the concept of constant health check up and proper laid down mechanisms of care become very important. This is especially important in a patients' health situation since it allows for daily monitoring of the patient's condition and gets a more accurate picture of the state of their health. It also means that the healthcare provider gets an opportunity to be in a better position to identify any new or worsening symptoms of a patient with more ease and in a shorter time hence improving on the overall results. The patients could be treated with individual care plans depending on their needs and conditions and thus give a good understanding of the individual patient depending on medical history, routines, and so on. These may include specific treatments, specific diet and recommended exercises fitting to the patient's special need. With the help of continuity of monitoring and related individualization of the chronic disease process, patients are able to stick to the prescribed course of therapy and prevent further complications.

The progress of technology, especially in reporting and analysing data provide a positive outlook in dealing with the issues that arise with chronic illnesses. Data analysis is the method of examination of large arrays of data in order to discover relationships and trends that exist within the available information that can be of use in making effective decisions. While in health care data analytics can improve chronic illness treatment through monitoring, prognosis and individual approach [5].

The purpose of this research is to identify how data analytics can help patients as well as health care organizations with predictive algorithms, wearable health technology, and EHR in the context of diabetes and hypertension care. namely, it will focus on the role of continuous data acquisition and processing to improve the management of patients' conditions and early detection of trends or health risks and adjustment of treatment plans in real-time. Furthermore, we will also see how the proponents can conduct detailed analysis of data to create better care plans that are more local to the patient.

Technology especially the use of data is shaping up healthcare because it opens up possibilities of constant and individualized outcomes for chronic illnesses. Evidence has it that for patients with diabetes and hypertension, data analytics can revolution Alize health, by using real time management and analysis of disease trends and health complexities, likelihood of developing complications and creating quintessential care plans for each patient. Thus, by leveraging big data techniques to advance healthcare, patients' health can be better managed and treated early or even prevented at all in the future, therefore creating a significantly less burden for millions of individuals suffering from these chronic diseases and improve their quality of life.

This ensures that consumer health information flows through real-time, from wearable devices, mobile health applications, and EHRs, hence enabling constant analysis. Such data sources include important data on key health parameters such as blood glucose levels, blood pressure, physical activity level and medication compliance. Through the process of quantitative analysis, healthcare providers can follow trends in patients' health states and determine that there is a necessity of medical interference. For instance, a patient's wearable device may record regular elevated blood pressure levels during a specific time of the day and therefore the healthcare provider may vary the patient's dosage or prescribe changes in the consumption pattern. Another advantage created by continuous monitoring is the patient's growing

involvement in managing his/her disease and overall health, since the process allows checking the patient's progress and share feedback instantly [6].

Additionally, information technology can enable propagation of fine tuned discharge plans peculiar to each patient. previously, the health care of patients with chronic diseases was based on similar thinking which involves using the same management protocols for all people regardless of their hepatitis C viral load. This approach, however, does not consider the issue of variations in Genetic Vulnerability of patients that may affect the outcome of the treatment; Lifestyles; and pre-existing medical conditions. Hence, by getting analytics, the healthcare providers are able to do away with this constant one-size-fits-all by using details of a specific individual to come up with the best treatment plans. For instance, information from EHRs can give the healthcare provider an understanding of the patient's health records, in which ways the healthcare provider will ensure that the patient with diabetes has a treatment plan corresponding with diagnosis that includes hypertension or cardiac disease. Moreover, decision-support can predict disease trajectory and other potential adverse events and manage to make changes a patient's care [7].

Therefore, the inclusion of data analytics in the chronic disease management can well help to not only provide a better health status of patients with diabetes and hypertension, more extended life and quality life but also decrease healthcare costs in the long term. This knowledge ensures that through the collection and analysis of data, healthcare is made more constant and specific to the patient's needs in order to make the right treatments at the right time. What has happened in the last few years is that through the incredible access to health data, healthcare providers can provide more relevant and effective personal care to patients and in doing so, they will be able to serve them better [8].

Materials and Methods

Application of Data Analytics in Chronic Diseases, such as Diabetic persons and Hypertension Suffers depends on the quality, the scope, and the type of information that is received from the patients. The primary sources of health data include wearables, EHRs, and mHM each of which assumes a significant part in procur[ing] real-time health data vital to individualized patient care [9].

Smartwatches, monitors like the continuous glucose monitor, fitness trackers are some of the more frequently used devices in chronic illness management. They also continuously monitor other physical parameters such as heart rate, activity levels, blood pressure and blood glucose levels among others. For diabetes patients, CGMs give a steady flow of glucose concentration throughout day and night and lets patients and the healthcare professionals know if they have hit a high or low note. In hypertension cases, blood pressure monitors connected to mobile applications enable the recording of blood pressure regularly, which helps workers in the health sector to note trends and change the patient's treatment accordingly. The advantages of wearable technology are that it can monitor patient's activity in natural conditions, outside of the clinic, and therefore gives more accurate and reliable information about the patient.

EHRs are also another major source of data Electronic Health Record means a formal record of health-related information of an individual that includes the compiled medical history of a particular patient. EHRs collect large volumes of formatted and nonformatted data such as, the patient's age, gender, ethnicity, comprehensive records of their health history, lab results, medication history and a treatment plan. This data is important to adorn the real-time health data collected through the wearables to make much sense. For instance, if a patient with hypertension or high blood pressure suddenly develops a new

value, EHR data will enable the physicians to know whether this is due to a new disease like kidney disease or whether the patient has changed the dose of the medicine taken. Further, EHRs can help providers document the health of the patient over a period, between different healthcare organisations or hospitals to ensure continuity of care in the management of the patients' chronic illnesses. Under the conditions of integrated EHRs and wearable devices data, the healthcare providers gain more comprehensible view of the patient's health, which will promote effective treatment plans [10].

Another useful implementation of chronic disease management is the use of mobile health applications also known as mHealth apps; they are even more effective when used in combination with wearables and EHRs. They enable patients to monitor different aspects of health including the diet, exercise, sleep and even medication schedules. For example, diabetes patients can take mobile applications which help record meals and insulin injections with the corresponding CGM blood glucose level. Hypertension patients can record their daily dietary sodium intake as well as the exercises they are performing and this will enable the healthcare professionals to see the extent to which lifestyle is affecting their blood pressure. mHealth apps also facilitate a direct reporting channel for patients to their healthcare providers hence achieving early detection and modifications in care plans under real-time information.

As an extension of the objective and nature of health informatics, various types of health data that are used are described here.

Upon applying the approach, significant amounts of physiological, lifestyle and behaviour data arise in managing chronic diseases such as diabetes and hypertension. Of a longitudinally considered, the three physiological parameters that are most closely associated with chronic disease management include blood glucose level, blood pressure, pulse rate, and body weight. Diabetes patients for example need their blood glucose data in order to determine how well the body is regulating insulin and to evaluate treatment effectiveness. Likewise for hypertension patients, normal blood pressure check makes it possible for a healthcare provider to determine the efficiency of any prescribed antihypertensive agents and other interventions which patients may be implementing in their daily life. Other physiological data include Heart rate variability and the body mass index (BMI) are valuable in observing the general cardiovascular status and cardiovascular-related risk factors for both diabetes and hypertension.

Other than the underlying medical condition, lifestyle data regarding diet, physical activity, sleep and stress are also relevant. For instance, application of calorie counting is vital for those with diabetes type 2 to regulate their Insulin to carb ration. While information on the level of physical activity can be obtained from such activity trackers as shoes and hand holders, usage of wearable fitness trackers can assist healthcare practitioners to know the effect of exercise on blood pressure and glucose level and recommend the right level of activity. Another data that is significant in assessing health is sleep data since poor quality of sleep adds to the worsening of diabetes and hypertension complications. In this way when combining lifestyle data with physiological data, physicians can give better recommendations according to the complete picture of a patient's health.

Another important concept of chronic disease management is behavioural evidence including patients' adherence to medications and self-reported symptoms. Several mHealth apps enable patient's to record their medication schedule and any side effects or symptoms they may develop. It assists the healthcare providers in recognising various trends of nonadherence for inefficient disease control to be made and in responding accordingly. For instance, if a hypertension patient is not adhering to their regime and has been missing doses on their prescribed medicine this is a signal that the doctor should change the daily dosage to a single one or use other types of treatment.

It is by employing big data analytic tools and software that the seemingly overwhelming mass of health data that is produced from several sources can be analysed. For example, machine learning methods are able to analyse big data for patterns, behaviour and relationships that might not be easily discerned by the naked eye. It has been reported that the machine-domain learning can help in decision supports in chronic diseases, with regard to the probability of the development of the disease, factors that can increase the risk of contracting the disease, and even suggest on the likely output for the patient especially considering the historical data of similar cases. For instance, predictive analytics for a diabetic patient can make inference on blood glucose patterns over certain period and then be able to determine the probability of the next hyperglycaemic event hence reduce complications [11].

Data management platforms play the critical role in aggregating the patient data across multiple sources including wearable device data, EHR, and mMHealth apps data. They collate information into one database where programmers can feed a healthcare provider with a patient's overall record of his/her health history. A few of the modern and sophisticated data management platforms also consist of artificial intelligence (AI) and machine learning features for real-time analysis and reporting. For instance, an application that is designed to manage data pertaining to a particular patient could notify the healthcare provider if the readings of a patient's blood pressure are high recommending changes to the medication as well as lifestyle changes.

The designing of the study concerning the impact of data analytics in chronic disease management involves registration of actual time information from the patient, the analysis of these data for signs of advancement of possible health complications, and formulation of the unique care plans. Real-time data collection is achieved by wearable technology and mHealth apps, which are constantly monitoring the health status parameters including blood glucose level, blood pressure, heart rate, and activity level. The data is then forwarded to a comprehensive data management system through which the information is correlated with other EHR data of the patient.

The method used to establish patient specific care plans is based on data analysis as will be discussed below. With the help of the algorithms a number of patterns are defined and the future health status is forecasted. For example, blood glucose patterns of a diabetes patient may show that the current medications help the patient poorly to manage glucose levels. By such observations, the healthcare provider is able to change the dosage of the patient's medicine or suggest the best changes to be made on the patient's diet and exercises. Likewise, for a hypertension patient, constant checking of the blood pressure may indicate that the blood pressure rises after taking specific foods or while under pressure at work, and, therefore, may urge the healthcare provider to advise on change of diet or stress reduction strategies.

Supplementary mobile health apps and other remote monitoring tools keeps continuous vigilance over the chronic diseases because they supply real time feedback to the patient and the health care provider. These systems help the health care providers to keep track of a patient in between visits so that they can attend to them as soon as possible if the case requires so. For example, if the blood glucose levels of a diabetes patient are beyond some limit, his/her healthcare provider can be notified and advised on the best way to reduce the levels to acceptable levels.

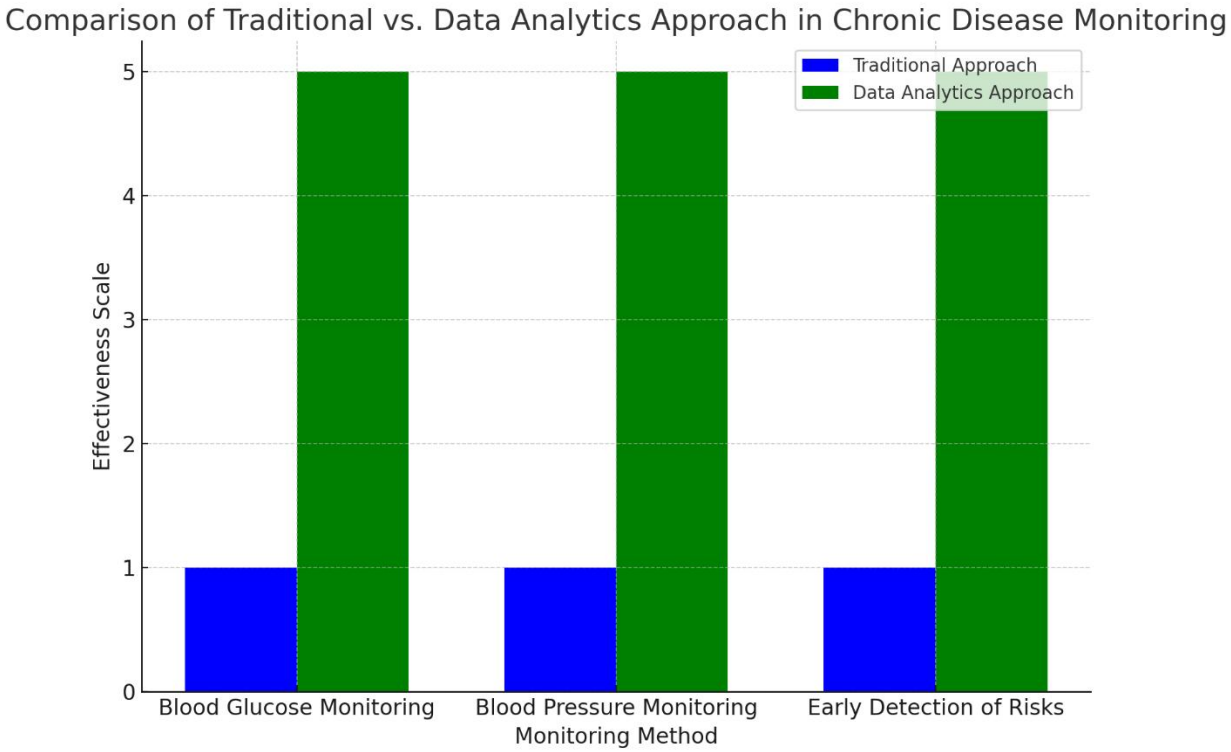
The communication therefore between the patients and the care providers is critical so as to ensure that the care is continuous and relevant. The patient can get feedback from the application such as a reminder to take the medicine or notification related to the pathological change in the health parameters or recommendation for any lifestyle change. Providers, in the same vein, get to view live data dials that present important health information about a patient alongside notifications of alarming trends. These two

cycles make sure that different patients get to get their interventions on time and are encouraged to take on different responsibilities of their health.
Therefore, the use of wearable gadgets in conjunction with EHR, mHealth apps and performance of big data analytics would present an appropriate model to attend to chronic diseases such as diabetes and hypertension. In line with the changes and innovation brought by big data, healthcare providers can create workable and implementable care delivery models aimed at chronic illness which would enhance the patients' lives and optimize the delivery of health services.

Results

One of the major fields where data analytics has been of major help is in chronic diseases including diabetes and hypertension; this has enhanced the monitoring accuracy. In the past, patients would only go to see their healthcare provider now and then and therefore have very few input parameters that healthcare providers can monitor including inputs generated during routine visits. Although to some extent it remains the same now with the advancements of wearable technology, CGM devices, and Smartphone applications, the healthcare providers are in a position to have real-time data for their interpretation. It has provided a better accuracy in monitoring vital aspects of a patient's health like blood glucose levels in Blood and blood pressures so as to give early intervention when it goes out of the normal range.
In the case of diabetes patients, CCM allows monitoring of the changes in blood glucose levels during the day, as contrasted to the traditional point measurement. This real-time data helps to adjust of the insulin dosages frequently in order to avoid high or low levels of blood Glucose which affects most diabetic persons. In the same way, hypertension patients reap from constant control of blood pressure, it helps the doctor to notice trends like consistently high blood pressure reading or erratic fluctuations which call for a change in treatment [12].
The identification of possible future health risks or worsening of disease states are other points that suggest the superiority of monitory with the help of data. It can be possible through metrics that identify trends and variation in a patient's health condition and alert the healthcare providers to take appropriate action before the health status of the patient deteriorates. For instance, if a hypertensive patient has been recording elevated blood pressure for a specific period, the doctor will be able to diagnose and prescribe medication or encourage the patient to change his or her lifestyle to avoid repercussions of the illness, such as heart ailments or stroke. It outlines the measures to be taken to prevent complications associated with disease progression, and thus eliminates the instances of admission to the hospital that are costly, time-consuming and ineffective in the long run to patients.

Monitoring Method	Traditional Approach	Data Analytics Approach
Blood Glucose Monitoring	Periodic testing (finger pricks)	Continuous monitoring (CGMs)
Blood Pressure Monitoring	In-office measurements	Wearable devices, daily tracking
Early Detection of Risks	Reactive (after symptoms arise)	Proactive (predictive analytics)



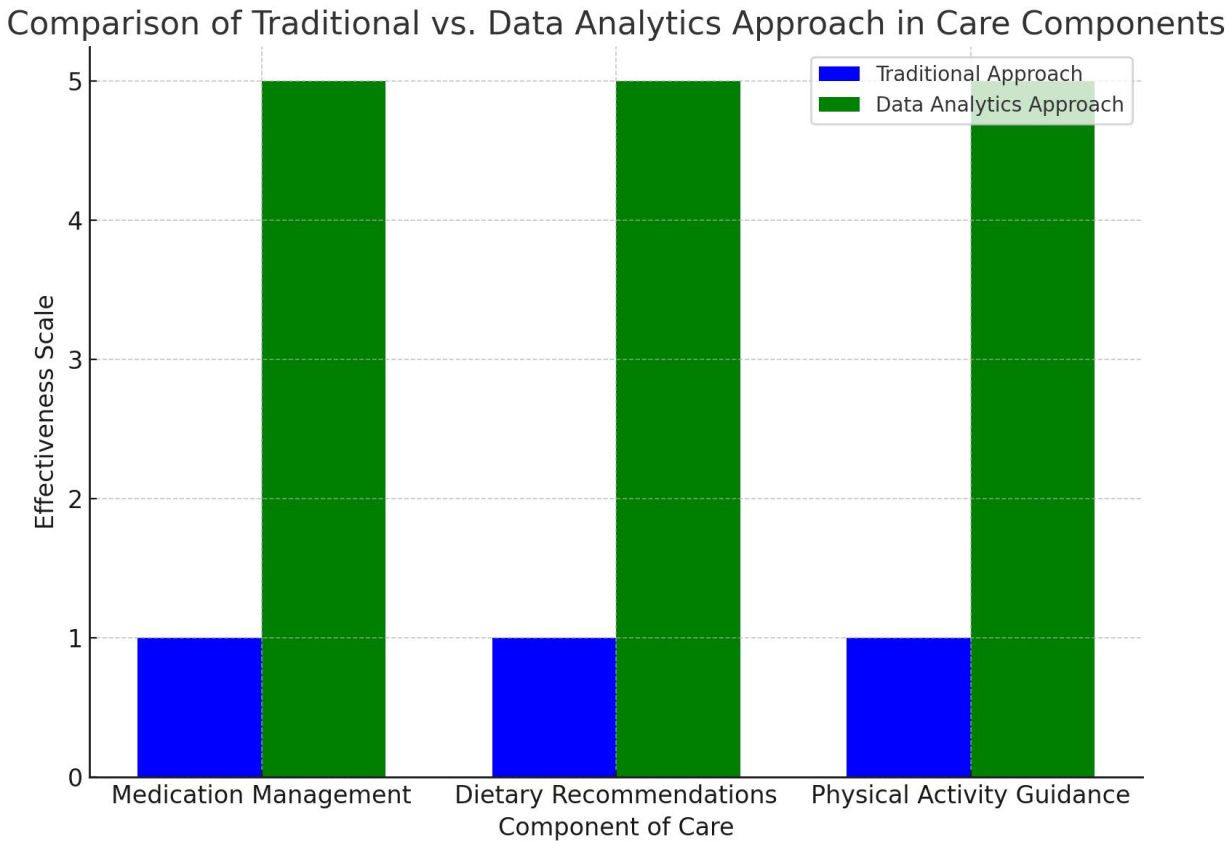
Perhaps the greatest breakthrough that chronic disease management has received from data analytics is creating personal care plans. While the traditional medical approach might involve an application of general strategies which do not consider differences in the course of the disease, big data analysis results in truly unique treatment plans. Interpreting data from fitness trackers, EHRs as well as mHealth applications, clinicians can adapt a patient's management plan to his/her metrics, health records, and habits.

Such care plans consider all aspects ranging from how the human body metabolizes drugs and chemicals to the results of lifestyle changes to genetic characteristics. For example, a diabetic patient, who has consistently high blood sugary level upon following the standard treatment plan may require a change in medication due to data accumulated from CGM. In this case, the machine learning algorithms flag various signs that indicate more than likely the patient is resistant to insulin; the doctor suggests the right medication dosage or advises the patient on the right diets to take. In the case of hypertension specific interventions may include possible changes in the patient's antihypertensive medications, individualized recommendations for increasing physical activity or suggested dietary improvements based on the data obtained of the patient from wearables in relation to the levels of physical activity and heart rate variability.

Recommendations on dieting, exercising, and doses and frequency of medications are also major parts of such care plans. The use of data analytics could ensure the patient gets precise information on what time he/she should consume it, which foods should be avoided and how much exercise should be done based on the disease. For instance, a hypertensive patient who develops high blood pressure after taking foods with high salt content can be advised on how to lower his or her salt intake. Likewise, a diabetic patient

can get custom advice regarding the volume and frequency of insulin administered to him/her depending on the hourly blood glucose levels and carbohydrates intake. These individualised care patterns enhance compliance to the recommended treatments hence enhancing the disease control and overall health. [13]

Component of Care	**Traditional Approach**	**Data Analytics Approach**
Medication Management	Standard dosage based on guidelines	Adjusted based on real-time health data
Dietary Recommendations	General advice (e.g., reduce sugar/salt)	Personalized based on data from health apps
Physical Activity Guidance	Broad exercise recommendations	Tailored to individual's daily activity levels



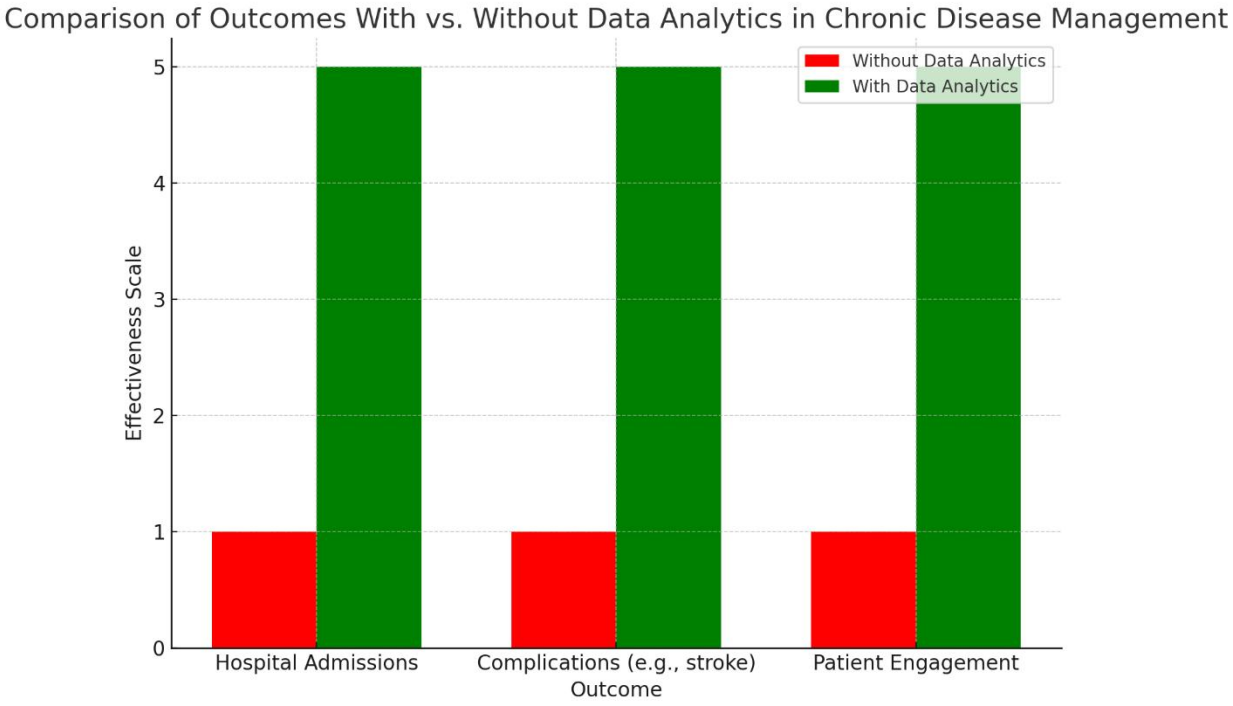
By implementing the methods of continuous monitoring and individual approach for patients a proper result has been achieved in treatment of chronic diseases such as diabetes and hypertension. One of the major benefits include limitation of hospitalization and other associated problems such as heart disease, kidney damage, and stroke all of which affect individuals with chronic ailments. Timely data becomes alerts that help healthcare providers to change patients' intervention early enough before disease becomes worsened and requires augmented acute care.

Moreover, through data analytics patient interactions have been improved along with self-management of chronic diseases. Rather than patients strictly following the instructions of healthcare professionals, through using health care wearables and mobile applications, the patients receive the information on their health state within the process of continuous monitoring and become more active in the management of diseases. For instance, a patient diagnosed with diabetes and has been able to check his/her blood glucose level during a particular day will be in a better position to manage his/her diet and even the insulin intake. Likewise, the hypertensive patients who monitor their blood pressure have better adherence to medication prescription and changes in behaviour including avoiding the use of salt in preparation of food or regular exercises. therefore, ore results in enhanced compliance with treatment regimens and improved clinical health statuses in the long run.

However, what has not been highlighted in previous studies is that when people take high amounts of responsibility for the management of their chronic diseases then the cost of healthcare is reduced

substantially. Through minimization of emergent episodes caused by diseases, data applications in disease management minimize the monetary expense of both the patient and the healthcare facilities. This is a major advantage in terms of expenses saving especially in countries with high health cost regarding the management of chronic diseases.

Outcome	**Without Data Analytics**	**With Data Analytics**
Hospital Admissions	Frequent due to unmanaged complications	Reduced with early interventions
Complications (e.g., stroke)	Higher risk due to delayed treatment	Lower risk with proactive care adjustments
Patient Engagement	Limited, based on periodic check-ups	Increased with real-time feedback and tracking



Still, it would be right to argue that one of the biggest advantages of data analytics in the chronic disease management is the possibility to predict future developments of the disease on the grounds of certain patterns detected. In processing data from many patients who have the same symptoms or the same diagnosis, artificial intelligence systems can, using machine learning, uncover a feature that a clinician will not be able to recognize at first glance. These algorithms are able to foresee which patients are most likely to experience complications by means of medication adherence and lifestyle habits as well as changes in physiological data trends.

For example, the use of clinical decision support can predict how a patient with diabetes, would be at risk of experiencing cardiovascular related complications, by analysing his/her blood glucose level fluctuations, heart rate variability among other factors. Likewise, for hypertension patients predictive models exist where those most prone to getting heart disease or stroke in the long run depending on blood pressure reading, lifestyle data as well as heredity. With this knowledge, healthcare providers can intervene and treat it before complications arise thus enabling changes on the course of treatment to be made or increased intensity of treatment to be recommended.

Such predictive functions are useful especially when it comes to chronic diseases as the main purpose is not only to cure the symptoms and make a patient feel better; the goal is to change the further disease course and make the patient's life as comfortable as possible. Applying the capabilities of prediction analytics, healthcare providers can decide on recommending effective long-term strategies and interventions which will have positive impact on patient's health and decrease the overall disease burden of chronic diseases to both the patients and the healthcare organizations.

All in all, the application of data analytics in the management of chronic diseases enhances the accurate measurement and monitoring of the diseases, development of individual care plans, improvement of the

patient's health and disease prognosis. Subsequently, by collection of data and their frequent analysis, the healthcare providers are able to provide more meaningful and sensitive care that enhances the quality as well as diminishing further costs.

Discussion

The incorporation of data analytics in management of chronic diseases has enhanced healthcare delivery by making it more proactive, sensitive to patients' needs, and concrete. This way the level of constant and real time monitoring of the patients translates to better evaluation of their well-being. While in the conventional model, patients visit the clinics and doctors give them feedback after they have collected data from only a few sources, constant use of wearables, m-health apps, and remote monitoring in patient's everyday life provide a constant feed of data to the healthcare providers. This real time analysis also helps in early identification of deviations in health indicators for example blood glucose or blood pressure and subsequent management. For example, if a patient diagnosed with diabetes begins experiencing increasing blood sugar, the health care professional is alert to the problem before the client ends up with hyperglycaemic crisis. In the same way, hypertension patients can track their blood pressure in real time and avoid such conditions as strokes or heart attacks [14].

The final advantage of data analytics involves creating the care plans that are specific to the patient as dictated by the patient's data. This entails increased stay rates, simply because the revealed regimen is more applicable to patients' daily schedules and, therefore, the condition they have. For example, instead of a general advice of for example doing exercises or taking healthy foods data analytics enables practitioners of giving concrete suggestions, for example the measure of exercises that an individual should take in a day or a change in diet based on real time data from wearable technology devices. Besides, the outlined approach increases the level of patients' involvement in treatment and, therefore, contributes to the overall adherence to treatment regimens. Patients get a sense of self management which psychologically propels them to adhere to laid down instructions. In relation to diabetes and hypertension, increased medication compliance translates to positive results in such illnesses and lowering potential for such problems as kidney disease, problems with nerves, or cardiovascular disorders [15].

Another benefit for the healthcare systems implementing data analytics in the management of chronic diseases, is cost reduction. In this regard, continuous monitoring assists in carrying out preventive health care hence avoiding emergencies, admissions and costly treatments for complications. For instance, a patient who has hypertension, gets a checkup after observing a pattern of continuously spiking blood pressure does not have to suffer the expensive implications of a stroke or heart attack. This change from curative to preventive care is also beneficial to the patient as it enhances the quality of their life and also relieves the expenses of the health facilities. Preventive and timely interventions enhance the utilization of resources hence minimizing hospitalizations, and where needed, reduction of the use of the expensively priced emergency services hence the reduction of the overall cost of healthcare [16].

Nevertheless, there lies various shortcomings and barriers to the implementation of data analytics in the management of chronic diseases. Some of the issues include but not limited to; privacy and protection of data. Given the flood of personal health data being generated from wearables, mobile applications, and EHRs, safeguarding this type of data is very vital. Security threats in the health sector have inevitable impacts on patients for instance, somebody's identity is stolen, or third parties get access to one's health records. Further, the modern healthcare industry is considered to be an attractive target for cyber criminals and with the rising use of digital health platforms, the threat of data loss becomes even higher.

Privacy of the patient's information can only be achieved by strong data encryption, cloud storage of the data and meeting regulatory requirement such as HIPAA in USA. However, the cost and implementation of these measurers is expensive and impractical especially for small health care providers to embrace data analytics tools [17].

Data intermediation is another issue since it concerns data exchange between multiple healthcare systems. Presently, health care data is integrated in various systems and it becomes hard for a health care provider to have a snapshot view of the patient. For instance, an individual may have his/her information saved at his/her PCM, a hospital's records, and in apps and wearables that he/she uses. And because there is no method of having one unifying platform for the consolidation of information coming from numerous databases, the analysis of health information becomes more challenging for the AI. To derive maximum benefits from data analytics, these integration problems have to overcome and implement health- centric integrated technologies that enable seamless transfer and analysis of personal health information across different systems. This is only possible if all the stakeholders in the healthcare system which include the providers, software developers and the regulatory authorities develop a technique on the ways of developing a common system that will facilitate the sharing of this information [18].

Another disadvantage of chronic disease management with the help of data analytics is the problem of data overload. It has been observed that because of constant data feed from patients, the healthcare providers may get drowned with the amount of data that is fed to them. These overwhelming amounts of information can thus cause the development of high workloads to healthcare professionals to look for other relevant information, and act accordingly. If there are no good and efficient data management solutions in place then much of the data can go unnoticed and though healthcare providers are supposed to monitor every patient data they can fail to do so efficiently. This goes a long way in explaining why there is the need to incorporate advanced data analytics, like machine learning algorithms that scan for any problem and notify the relevant health care providers without human intervention. However, there are challenges associated with such systems' implementation, which can be discouraging for healthcare providers from the developing nations.

As for the future considerations it is worth noting that the increase of the amount of information used for prediction with the help of artificial intelligence (AI) may prove beneficial in chronic disease management in the future. For instance, AI algorithms can look at large amounts of data as they are collected in real time and look for patterns that may indicate that a complication is on the horizon before it has actually developed into something that doctors and nurses can actually recognize. For instance, in the case of diabetes, AI can measure patterns of glucose level fluctuations and provide a prediction of the likelihood of hypoglycemics or hyperglycaemic episodes hence allowing a patient and or a doctor to act accordingly. Likewise, for hypertension patients, AI exposes the probability of future cardiovascular events with the CABG using continuous blood pressure monitoring and heart rate variability of the patient and recording the lifestyle. Such preventive skills will enhance even better anticipation and attention to patients, decreasing possibility of more complexities and enhancing customers' lives. In the future, with the progress of AI application, their combination with wearable equipment, mobile health applications, and EHRs will improve the ability of immediate decision-making in chronic disease care [19].

Another promising are the future developments in the field of telemedicine and remote monitoring based on data analytics. The state of the entire global health care system has shifted due to the COVID-19 pandemic which has prompted the use of telemedicine especially in the management of clients with chronic illnesses as the physicians can assess their conditions and even prescribe treatment without physical contact with them. Data analytics have a significant role to play in this by supporting constant

and distant patient assessment, subsequently implying the ability to assist the healthcare providers to monitor the patients' physical acumen and manage to intercede in the process. Real-time telemedicine and data analytics integration also makes the provision of treatment by doctors more economical and convenient for the patient especially those in the rural or remote areas. Telemedicine has witnessed more acceptance in the chronic disease management because of the increased use of remote monitoring devices like the wearable blood pressure cuff, glucose monitor, and the heartbeat tracker with analytics support from the Artificial Intelligence.

Therefore, there are some advantages and disadvantages of data analytics in the case of the management of chronicle diseases such as diabetes and hypertension, Nevertheless, there exists several issues and limitation in the utilization of data analytics and the expansion of its horizon. The opportunity to observe patients' conditions in real time, establish persons-tailored treatment plans, and save overall healthcare expenses by focusing on early interventions is revolutionary. But problems of data privacy, data integration, and data which are many at times become challenges. Future developments are being seen to build on the progress till now; in the same light, both growth of artificial intelligence and an advancement in telemedicine is expected to enrich the aspect of data analytics in chronic disease management another platform of changing patient's outcome and or reducing global impact of these diseases [20].

Conclusion

Thus, data analytics has made a positive impact to chronic disease such as diabetes and hypertension by making continuous monitoring a reality and create care plans that will suit the patient. It has not only helped in improving the strategies of accurate and timely interventions but has also assisted in improving the quality of the disease diagnosis and the reduced hospitalization rates and in turn has helped in controlling the cost incurred in the healthcare systems. Mobile health apps along with wearables and EHRs help in gaining real-time data which would make the healthcare providers take preventive measures instead of waiting for the problem to occur. Further advancements are expected in applying data analytics with artificial intelligence (AI) and machine learning to have a more robust predictive model and shift towards chronic disease management patient centred care models. As such, this evolution will redefine managerial options of chronic diseases by making the care more efficient, effective and patient centered.

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