LEVERAGING ON TECHNOLOGY TO DIAGNOSE AND PREDICT DISEASES THROUGH PREVENTIVE HEALTH CHECKUPS

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The IIHMR University, Jaipur

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in

Hospital and Health Management

By

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Under the Supervision and Guidance of

Dr Varsha Tanu

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GODREJ MEMORIAL HOSPITAL
COMPASSIONATE CARE FOR ALL
(NABH & NABL Accredited)

Ref no: GMH/HRD/INTERN/EXP.LTR./24/ 0522 **Date:02-Jul-2024**

To Whomsoever it may concern

This is to certify that **Dr. Akshat Patel** from Indian Institute of Health Management Research, Jaipur has satisfactorily completed his internship/ dissertation in the Department of **Hospital Operations** at **Godrej Memorial Hospital**, from **01-Apr-2024 to 30-Jun-2024.**

The study on **Leveraging on Technology to Diagnose and Predict Diseases through Preventive Health Checkups** was undertaken as a part of his academic fulfillment in the Department of **Hospital Operations.**

Yours Truly
For Godrej Memorial Hospital

Lt. Col. Dr. L C Verma (Retd.)
Chief Executive Officer

DECLARATION BY STUDENT

I hereby declare that this dissertation titled "Leveraging on technology to diagnose and predict diseases through preventive health checkups." is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Dr. Akshat Patel

Date - 05/07/2024

CERTIFICATE

IIHMR UNIVERSITY

This is to certify that dissertation titled **"Leveraging on technology to diagnose and predict diseases through preventive health checkups."** is a record of the research work undertaken by Dr. Akshat Patel in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/~~her~~ approach to the research study has been sincere, scientific, and analytical.

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Dr. Sanjay Gupta
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Abstract

Background

Whole genome sequencing (WGS) and exome sequencing are rapidly being incorporated as routine components of diagnosis and explanation of rare disorders, and the trend is moving toward utilization of these for risk assessment for common diseases as well. Each month, novel mutations (either de novo or transmitted) that are causal for conditions such as autism, primary immunodeficiency, and craniofacial abnormalities are reported. In parallel, widespread adoption of genome-wide association studies (GWAS) have identified thousands of loci that contribute to multifactorial diseases as diverse as diabetes, asthma, and depression. Because environmental factors make a substantial contribution to these latter conditions, 'prediction' is too strong a claim for genomic medicine, but risk stratification is certainly feasible.

Here we explore how WGS might be incorporated alongside traditional clinical evaluation as part of preventive medical care and the maintenance of good health. The term 'whole genome sequencing' does not imply that the entire genome of everyone is sequenced, but rather should be taken to mean that total genomic DNA was sequenced to high depth, in contrast to targeted or whole exome sequencing.

Substantial technology advancements in the Medicare industry have resulted in a slew of advances in therapeutic interventions, patient health assistance programs, identifying trends in medical consequences, and so on. This also contributes to a plethora of information resources that can provide a range of forecasts on a lot of illnesses. The paper mentions technological advances in the health sector, as well as the intricacy of systems and data quantities that may be utilized to make sophisticated clinical forecasts. It illustrates the opportunities that Big Data (BD) and Machine Learning (ML) might offer to this profession by employing a system that uses a MATLAB/Simulink predictive model of a person's health and AzureML to identify potential cardiac issues.

Purpose of this study

The purpose of this study is to show how these two types of analysis, namely clinical and genomic, can be considered as complementary views of participant health. Clear instances of agreement and of discordance are described, and strategies for conditioning genomic risk assessment on clinical data are considered. We conclude with a discussion of how the complex and voluminous quantity of data might soon be distilled to support actionable medical inference and personal lifestyle choices.

Method

This is a qualitative study in which data flow, communication flow, clinical decision flow, sample flow, and data flow are used to determine genomic sequence through various health check-ups.

Results

Specific observations reveal that health genometer plans help in diagnosing diseases in the future and predict the risk of life-threatening implications in individuals' lives.
Also, this study will employ a qualitative research design, utilizing secondary data to explore the effectiveness, challenges, and implications of leveraging technology in preventive health check-ups, specifically focusing on the Health Genometer Plan. The research will show an in-depth analysis of existing literature, reports, case studies, and other relevant documents to gain insights into the use of technology in disease diagnosis and prediction.

Key words- Disease, Genometer, Health Check up, Preventing Healthcare, Genome Sequencing

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I am indebted to Godrej Memorial Hospital, Mumbai whose cooperationand assistance facilitated the secondary data extraction. Their dedication and support were vital in ensuring the smooth operation of the study.

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Lastly, I would like to express my deepest appreciation to my family for their unwavering support and understanding throughout this research journey. Their encouragement, patience,and belief in my abilities were invaluable motivators.

Thank You

Chapter 1:

I. INTRODUCTION

Technical and socioeconomic changes, as well as autoimmune disorders on the skyrocket of rapid urbanization and greater longevity, diverse illnesses, and unexplained mortality grounds because of a combination of variables, have raised the demand for excellent medical services. The increasing need for better, more effective, and tailored Clinical care facilities have necessitated the incorporation of informational and communications technology with medical equipment into a system of numerous dispersed datasets, including consumers, patients, physiological, and clinical evidence. By gathering, preserving, and analyzing health information, this developmental phase decides large amounts of data from which interesting information may be derived in providing answers to health-related concerns.

This paper is divided into five segments that provide a comprehensive view of medical assimilation with communications and information exchange innovations, as well as the developmental move into medical prognostication that goes with it, and is deduced with a test case.

II. ASSIMILATION OF INFORMATION TECHNOLOGY AND HEALTH CARE

Each person has a distinct DNA identity that is detected using a mix of criteria such as behavior, health records, and paternal ancestry. Certain metrics (for example, EMG, EEG, BLE, physical measure) can be observed and reviewed using a network of instruments, including bio sensing devices, nano sensors, and embedded systems. Sensing devices emerged in response to the necessity to monitor actions or variations when employed in conjunction with electronic-based mechanisms to effectively communicate with it via controllers. These sensors detect tangible variables (such as sunlight, humidity, and warmth) and transform them into a changeable electrical impulse.

Monitoring systems were integrated into the field because of advancements in semiconductors, information and communication techniques, computing, and mechatronics, as well as the need to upgrade to a more accurate, personalized health service depending on a person.

Internet infrastructural facilities, info, machine, and communications networks have enabled the connectivity of many machines to share data, opening the way for the tendency in health care services to incorporate sensing devices with the person to enable vital tracking for a more precise personal health prognostication – to anticipate malady outcomes results – utilizing the appropriate equipment.

Among the tested variables that are gathered is prospective data that can be derived utilizing sophisticated ML methods like "deep learning (DL)," by implementing methodologies that attempt to imitate biomedical neural pathways into orchestrated process framework to enable machines to

perceive the universe in terms of a ranking of notions and to gain knowledge from perception the relationship between each notion.

The medical field is primarily data driven, perhaps one of the greatest major obstacles for healthcare implementations and systems is the computation of vast quantities of information that must be gathered from numerous references, in multiple settings, and analyzed to derive styles that could represent solutions in diagnosing illness, personalized therapies, population - based patterns, personalized and optimized hospital assistance, and so on. The phrase "BD" refers to very massive and complicated data volumes that need sophisticated analytics for investigation, translation, and computational capacity to reveal unknown data trends and knowledge. BD in health care system is discussed from various viewpoints in paper [1]: one way utilizes clinical information to enhance medical care services, while the alternative leverages knowledge as a significant resource for digital safety. Because the purpose of this paper is to examine healthcare concerns through the lens of business intelligence, BD is discussed in connection to ML approaches such as Artificial Neural Networks (ANN). Computational modeling is used to offer results and create recommendations to transform data into thoughts and chances for making quicker and more effective judgments. AzureML is a technology utilized in this paper for generating advanced analytical answers derived from datasets, and it is used in the research scenario.

III. THREAT ELEMENTS FOR HEALTH

Medical care systems generate massive volumes of data, which may be converted into statistics for essential medical discoveries utilizing ever-evolving technology. The demand
for enhanced healthcare treatments and specialized assistance for people stems from a variety of factors such as environmental variation, an ageing urbanization,
impoverishment, and behavioral health illnesses because of many of the consequences of urbanization expansion.
As per, carcinoma, hypertension, coronary artery illness, obstructive pulmonary illnesses, and psychiatric illnesses contribute for 86 percent of mortality in the European
Community. Hazardous indicators such as cigarettes can raise the odds of early mortality by up to 50% between the age group of 60 and 75 for less energetic people, and this proportion reduces for energetic people. lists the most important risk variables that are currently recognized. The relationship connecting "potential cause" and "illness" has been demonstrated by arbitrary research of the pathogenic activity of particular chemicals over age, evolutionary factors, and culture, with the expanding epidemiological knowledge repository concerning the infectious illnesses.

With the upsurge of a wide range of nutritional goods (Elevated in sodium, lipids, sucrose content, flavors, and other materials) and the downgrading of a healthier daily lives in favor of one controlled by physiological and psychological anxiety because of productivity expansion,
these illness communities were considered "illnesses of the medieval world" unless it was discovered that these started to progressively impact sections of younger age, in addition to
other illnesses with rising prevalence (immunological sicknesses, diabetic neuropathy, etc.). Because of such characteristics, this has become a severe medical concern that necessitates a systematic strategy to, at the very minimum, reduce their result. The chapter that follows
discusses the significance of BD analytics and displays a methodology for medical forecasting in Matlab/Simulink, as well as a cardiovascular issue detection in AzureML.

TABLE 1: POTENTIAL REASON AND THREAT ELEMENTS FOR HEALTH

Potential Reason	Threat element
Heart Disease (e.g. Aortic arterial dysfunction, sudden myocardium infarction)	Hypertension; High sodium intake; The use of nicotine; High cholesterol; High blood sugar; Excess weight and being obese; genealogy of the ancestors;
Carcinoma (e.g. Adenocarcinoma)	The use of nicotine; Bad oxygen purity or irritating contact on a regular basis; a compromised immunological systems; genealogy of the ancestors; As a youngster, you had a background of chest diseases; Pneumonia, flu, sinusitis, TB, and HIV;
Long-term breathing Illness	The use of nicotine; Contact to allergens in the lungs for an extended period of time; A hereditary background of progressive pulmonary disease; Lung disorders;
	As a youngster, you had a background of chest diseases;
Diabetes	overindulgence in processed sweetener; hypertension; blood sugar intolerance problems; sedentary behavior; Excess weight and being obese;
Amnesia (e.g. Alzheimer)	Brain injuries; Ineffective interaction with others (isolation); Unhealthful way of living; Families genealogy – acquired ancestors' genetics; Age greater than 65 years; Moderate neurological dysfunction;
Other – Liver Disease	Long-term liquor Intake; Long-term infections hepatitis; Fatty lipids buildup around the liver;

IV. BIG DATA ANALYTICS ARCHITECTURE IN HEALTH PROGNOSIS

As knowledge and data sharing technique is integrated and developed in the clinical scheme, an IT architecture is decided to include for accumulating, storage, and analyzing info via comprehensive solution of datasets (cell phones, wearable innovations, clinical image processing, diagnostic tests, epigenetic and fingerprint scanners sensing details, telehealth devices, and quantities) to achieve performance requirements shipment for primary health care. This move against a more intellectual strategy in the healthcare field generates vast volumes of data that may be handled by specialist programs. BD refers to huge and complicated information volumes that need extensive analytics and reporting using computational methods in order to uncover underlying trends and correlations. Sophisticated computing data may be utilized to create tailored individual histories and better accurate therapies. The offered information's capability for detecting healthy and pathological behavior patterns associated with genetic background, chronic diseases, diet, and actual information (EKG, warmth, blood stiffness, and so on) is contributing to the emergence of information repositories. Figure 1 depicts a paradigm for illness prognosis based on BD and ML.

Figure 1. Architecture for medical prognosis by employing ML

Benefits of Health Genometer Plan:

1. Early Detection and Prevention

Timely Intervention: Identification of genetic predisposition to certain diseases will allow one to intervene in the process even before symptoms of the disease appear. Early intervention ensures treatment achievement and higher effectiveness.

Lifestyle Modifications: With an awareness of genetic risks, it is surer to stimulate individuals to change their lifestyles and observe a healthier diet, increase physical activity, and avoid other outlived ways harmful to one's health, like smoking.

2. Personalized Medicine

Tailored Treatments: Genetic information will enable treatment that is custom-made, allowing medical interventions to be directed appropriately. With personalized medicine, it would reduce adverse reactions and yield maximum therapeutic effect.

Targeted Therapies: Identification of genetic variations could result in targeted therapies that are most effective for groups of patients, thereby avoiding trial and error during treatment regime.

3. Optimal Management of Disease

Risk Stratification: Genetic test results can predict the levels of developing certain illnesses in patients, thus helping in focusing more aptly and using healthcare services in an efficient manner.

Proactive Heath Monitoring: It is easier to monitor high-risk people, as any manifestation of disease markers leads to steps being taken immediately and, hence, health issues are taken care of proactively.

4. Improved Research and Development

Data-Driven Insights: Most genetic data can offer insights into the mechanisms of diseases and, for this reason, bring out the discovery of new biomarkers and therapeutic targets.

Accelerated Drug Development: Pharmaceutical enterprises can exploit genetic information to accelerate the development of designed drugs based on defined genetic profiles, hence facilitating the development process and introduction of new treatments into the market fast.

5. Cost-Effectiveness

Lower Health Care Costs: Genetic testing stops the disease at its source or diagnoses the disease early on; therefore, it reduces expensive treatment costs and hospitalization in the long term.

Use of Resources: A more people-focused distribution of resources saves on time and excess testing and unnecessary interventions for people who may not be at great risk for a certain condition.

Informed Decision-Making: Patients who have knowledge about their genetic risks can make informed choices about what is best for their health and lifestyle.

Family Planning: Genetic data can lead and assist in family planning while helping the individual understand potential hereditary threats and how they may be averted.

7. Better public health outcomes

Population Health Management: By characterizing the data of the population genetically, the public health planners shall be in a much better position to design improved disease-planning and its management programs. Still, targeted towards the high-risk populations.

Epidemiological Insights: Genetic testing can provide details about the existence and distribution of genetic risk factors within various populations; thus, it is relevant to public health and policy planning.

8. Ethical and social issues
Informed Consent and Counseling: Genetic testing raises many ethical issues, for example, proper consent and adequate genetic counseling to explain to the individual what the results mean and their implications.
Privacy and confidentiality: In this regard, the privacy and confidentiality of genetic data should be highly protected vis-à-vis the installation of good security software for data, which would largely depend on the ethical considerations of its misuse.

Challenges and Limitations of a Health Genometer Plan to Predict Diseases in the Future

1. Ethical and Privacy Concerns
Data Privacy: The collection and storage of genetic information have high stakes in terms of privacy. Unauthorized access or data breach will risk misusing a very sensitive portion of information.
Informed Consent: Full appreciation of the implication of ND genetic testing and informed consent is crucial, but its provision is challenging.
Discrimination: Genetic information can possibly be used to take negative prospects among the employers, insurers, and others that may result in genetic discrimination.

2. Cost and Accessibility
Expensive: The initial costs of genetic testing and sequencing are very high, rendering it unaffordable to most people, especially in low- and middle-income areas.
Insurance: Some insurance companies do not offer covers on genetic testing, which may make it increasingly inaccessible to much of the population.
Equity Issues: There could be differences in the availability of genetic testing caused by factors such as the socioeconomic status, geographical location; among others, and therefore there would stem unequal benefits resulting from the same.

3. Technical and Scientific Limitations
Incomplete Knowledge: The human genome is so complex, and the science relationship which genetic variation plays in causing, triggering, and also in the progression of disease is so much is still evolving. There does not exist information on many genetic markers.
False positives and negatives: in some cases, the report result of the test can result in a false positive or false negative, causing unnecessary anxiety on one side and false reassurance on the other.
Interpretation Issues: Genetic data is very difficult to interpret accurately and, therefore, it is challenging and very subject to large expertise. Results may be interpreted differently by different experts.

4.Anxiety and Stress: Information of genetic risks often leads to psychological stress and anxiety, substantial in many cases. Their feelings of the qualitative discrepancy between diagnostic information and its significance and the lack of clearly stated measures of prevention. Area of influence Family dynamics: It would affect the family members of the individual under consideration in terms of complex emotional and social matters.
Informed Decision-Making: Patients will not be able to comprehend and make informed choices following complex genetic information in case they are not properly counseled and supported.

5. Regulatory and Legal Challenges
A strong Regulatory Stipulation: There is the need for a basis of regulation in the fast-evolving field of genomics to warrant the ethical use of genetic information, which in normal circumstances, happens to be quite difficult to implement and enforce.
Legal Safeguards: Sufficient legal safeguards are the prerequisites towards barring genetic discrimination and maintaining the confidentiality of genetic information.

6. Interfacing with Health Care Systems
Infrastructure Requirement: Infrastructural needs are heavy for the interfacing of genetic testing into existing health systems: technologically advanced labs, data storage facilities, and trained personnel.
Coordination of Care: This service entails a lot of diverse healthcare givers to have the right information on genetics properly interfaced with treatment and is cumbersome to manage.,
Training and human resources: The health workforce needs training and education also to translate genetic diaspora appropriately into patient care they present.

7.Societal and Cultural Barriers
Cultural Attitudes: Different cultural attitudes toward genetics and disease prediction may have an impact on the acceptance and implementation of a health genometer plan.
Misinformation and Stigma: There is the potential for misinformation and stigma due to their genetics peering evaluations being received; thus, such factors need to be accounted for in relation to the willingness of people to be tested and distribution of results.

8. Long-Term Sustainability
Sustained Ongoing Research Needs: Ongoing research is necessary to constantly match the strides made in genomics to increase the accuracy and application of genomic tests. Programs Sustainability: Maintenance and updating of genomic testing programs over time spans is accompanied by issues of program sustainability in terms of funding and resources.

CHAPTER 2:

Review of Literature:

1. Whole genome sequencing in support of wellness and health maintenance

This pilot study of eight individuals from the CHDW proposes two approaches for combining and conditioning clinical and genetic profiles, which could facilitate longitudinal evaluation of wellness-focused medical care based on comprehensive self-knowledge of medical risks. The study shows an excess of concordance between genetic prediction and observed sub-clinical disease. Further, we illustrate how a more holistic combination of genetic and clinical data can be achieved by visualizing risk in subclasses of disease. The visualization of concordance and discordance in the genetic and clinical profiles might help develop personalized health action plans in consultation with a health partner. We acknowledge that the data presented here falls short of the gold standards of evidence of inference that are typically required in genetic analysis of causation but argue that the objective of 'personalized genomics' is not necessarily to predict disease with any certainty, but rather to provide another line of evidence that physicians and other medical practitioners can consider in their interactions with patients.
Ultimately, the utility of the approach described here will require prospective evaluation in a cohort of healthy adults followed longitudinally for decades. As the volume of personalized information increases, the issue of who will be responsible for interpreting and explaining the assessments to individuals becomes more acute and suggests the need for training of a new class of genomic healthcare professional and development of novel ways to present the information.

2. Disease Diagnosis in Smart Healthcare: Innovation Technologies and Applications

This review has provided an up-to-date literature on emerging machine learning algorithms, optimization algorithms and applications in smart healthcare. Important challenges, including privacy, pilot studies and real project and communication between data analytics and medical staffs, have been discussed. These challenges are essential for the breakthrough of smart healthcare; otherwise, the wide adoption of machine learning and optimization algorithms in real deployment is difficult to succeed. To conclude, it is believed that human beings will enjoy more and more smart healthcare applications in the coming decades. It is worth ensuring the health services are financially viable and environmentally sustainable to safeguard the future health of our patients and the health services availability in the future.

3. Exploring the impact and utility of genomic sequencing in established CKD:

Genetics is expanding the field of nephrology to enable better diagnostics and treatments. Applications of clinical genomics for CKD have proven diagnostic efficacy and a growing body of evidence for impact and

utility. Understanding genomics including differences in sequencing approaches across different phenotypes of GKD is imperative to improve understanding and integration into clinical care. Nephrologists face several challenges in integrating genomics into clinical practice and require further education and support to improve patient outcomes. Further, genetics has the potential through clinical research to inform future nephrology clinical practice in polygenic dis- ease and pharmacogenomics, with the goal of improving patient outcomes. Developing clear research priorities in con- junction with key stakeholders is imperative to move the field forwards and enable iterative utility and impact focused implementation.

4. Disease Diagnosis in Smart Healthcare: Innovation, Technologies and Applications

This review has provided an up-to-date literature on emerging machine learning algorithms, optimization algorithms and applications in smart healthcare. Important challenges, including privacy, pilot studies and real project and communication between data analytics and medical staffs, have been discussed. These challenges are essential for the breakthrough of smart healthcare; otherwise, the wide adoption of machine learning and optimization algorithms in real deployment is difficult to succeed. To conclude, it is believed that human beings will enjoy more and more smart healthcare applications in the coming decades. It is worth ensuring the health services are financially viable and environmentally sustainable to safeguard the future health of our patients and the health services availability in the future.

5. Connecting systems, data, and people: A multidisciplinary research roadmap for chronic disease management

The past decade has seen an explosion in the amount of digital information stored in EHRs and “in the wild” data from mobile devices and other types of sensors. Over the same period, research has seen widespread advances in the field of artificial intelligence (AI), and specifically, the development and deployment of AI applications. In recent years, deep learning techniques have achieved greater success in many domains through deep hierarchical feature construction and capturing long-range dependencies in data in an effective manner.

CHAPTER 3:

METHODOLOGY

Study Design - Qualitative study design will be employed in tertiary care hospital in Mumbai.

Study Tool: Data from hospital through excel.

Study Population: Local Population of Vikhroli East, Mumbai and nearby areas.

Duration Of study– The study will be conducted for 3 Months.

Sample Size - The estimated sample size is: 140

Data collection Procedure –

Primary Data: Interviews with key stakeholders at Godrej Memorial Hospital, including doctors, nurses, IT staff, and patients.

Secondary data is collected from the genometer plan in the hospital via feedback forms and Review of hospital records, technology usage reports, patient health outcomes, and existing literature on technology in preventive healthcare.

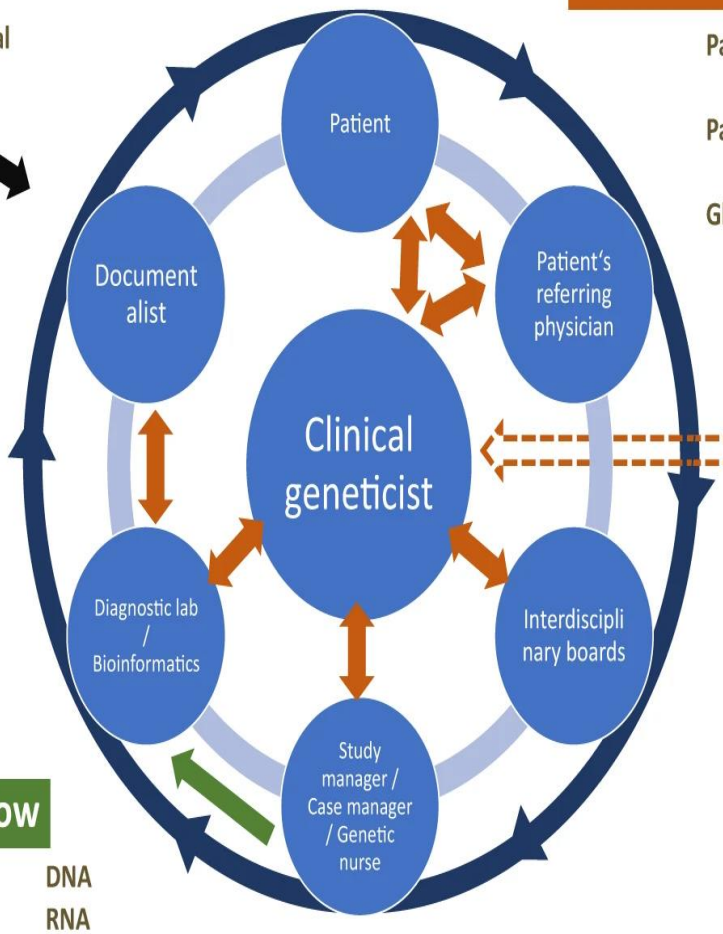
Data Analysis Plan – This data is analyzed by excel to determine outcomes of the technology in genome sequencing through heath check-up.

Data flow

Local / National / International
Data access
Data stewardship

Communication flow

Patient's autonomy
(Who will be informed on genomic data?)
Patient's approval
(What data should be reported?)
Global informed consent
(Use of data for research?)



Clinical decision flow

Reporting
Treatment & Management Decision
Potential research integration
Follow ups

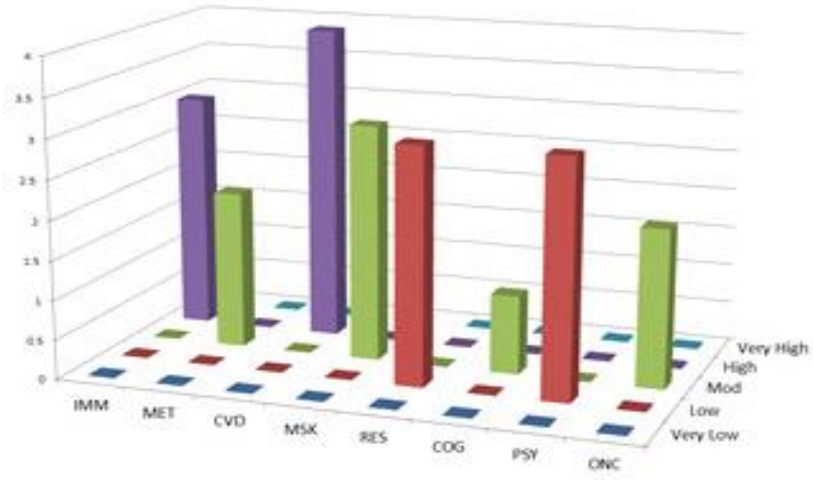
Sample flow

DNA
RNA
cf DNA
Biomarkers

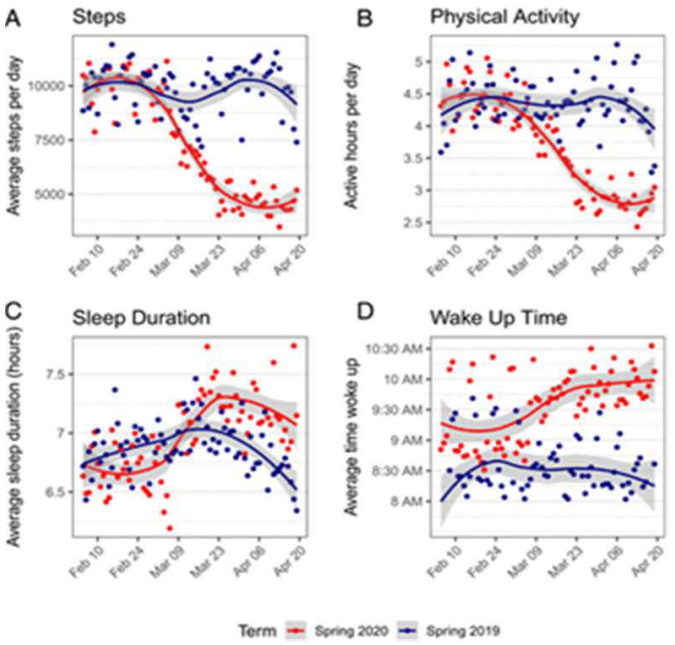
CHAPTER 4

RESULT AND FINDINGS

The objective of the whole scenario is to highlight the possible outcomes that BD and ML offer to the medical industry via a modelling a group of statistics to calculate the probability of forecasting a cardiovascular issue and analyzing the pattern of a clinical condition of patients; the modelling and advancement of the structure was done in the MATLAB/Simulink setting and AzureML utilizing computational library functions related to mathematics. Picking the ML strategy is difficult since it is not necessarily feasible to determine which is the perfect suited ahead of time. To make this procedure easier in this scenario, the
essential factors have been recognized:
i. type of data, volume, and reliability.
ii. intended result.
iii. the amount of effort spent on training or calculation.
iv. the intended degree of precision of the outcome

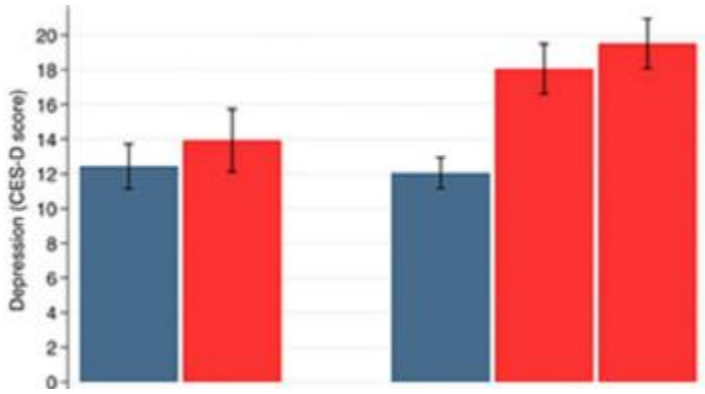


Proposal for ‘gridiron plot’ representation of clinical risk (y-axis) against genotypic risk (z-axis) in eight disease domains described in the text, for individual.

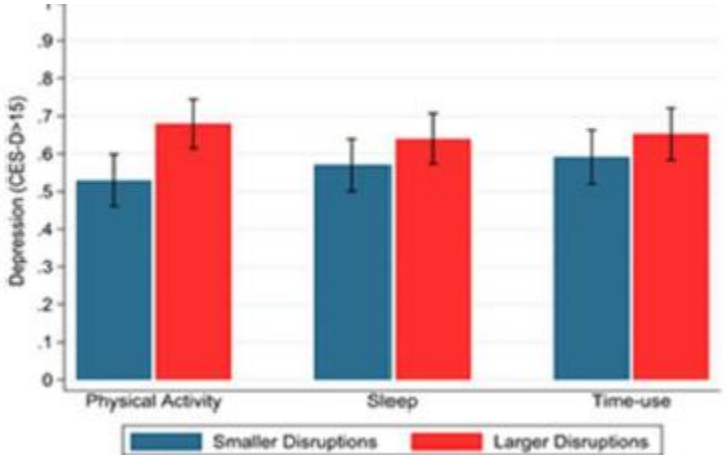


Modelled health condition relied on threat parameter – blue, estimated condition using ANN – red.

A multivariate extrapolation method is developed to forecast the quantity of a parameter depending on the measurements of additional parameters, and the relationship between information may be defined by a straight equation with a specific level of precision. For this research scenario, the threat rating is computed by evaluating the relationship between the data packet components. Due to the obvious inter-relationships among the predictor factors, the information is strongly linked, resulting in a multi -collinearity issue.



Delta proportions between the modelled and actual health states.



Health condition simulation related to threat factors.

The above figure highlights the depiction of the disparity between the anticipated and actual states, with the comment that the outcome may be enhanced by employing a larger set of statistics and more in-depth learning.

Findings

Current State of Technology:
An assessment of the existing technologies for preventive health checkups at Godrej Memorial Hospital, their capabilities, and limitations, and what can be done to improve their conditions.

Diagnostic Tools: Available diagnostic technologies and their applicability.

Health Information Systems: Evaluation based on EHR services and data management systems.

Patient Engagement Platforms: Assessment of patient portals, telehealth services, and mobile health applications.

CHAPTER 5

DISCUSSION AND CONCLUSION:

Potential Technologies

Exploration of advanced technologies that can be incorporated within the preventive health framework of the hospital.

Artificial Intelligence and Machine Learning: How can this cutting-edge technology be of value to the predictive analytics and decision support systems of a hospital.
Genomics: How the hospital can incorporate genomics in genetic screening and personalized risk assessment.
Wearable Devices: Use of continuous monitoring devices, and how their results can be integrated into the care plans.
Telemedicine: How the hospital can increase telehealth services, especially the preventive part of it—consultation and follow-up.

Discussion

Integration Strategies

How advanced technologies will be inculcated within the provision of preventive hospital care, confront and sail through the envisaged challenges associated with the implementation process, and also ensure that the system would run seamlessly.
Data Privacy and security: ensure that patients data is safe and will not be used against them but also lives to the regulatory requirements.
Cost-benefit analysis: what it would cost to inculcate new technologies and the return on the entity.

Training and development: design training programs to help health personnel to use new technologies appropriately.

Collaboration: work together with the technology providers, research institutions, and finally policymakers.

Impact on Patient Outcomes and Healthcare Efficiency
Elaboration on how technology-driven preventive health checkups at Godrej Memorial Hospital can assist in enhancing patient outcomes and health efficiency.

Early Detection and Intervention: Advanced diagnostics may help in detecting diseases early and providing timely interventions.

Patient Engagement and Satisfaction: Increased patient satisfaction from personalized care at an individual level and clear communication chains to the patient.

Operational Efficiency: It smooths out healthcare processes and reduces the strain on hospital resources.

Recommendations

Based on the findings, this paper will put forward action points to enable Godrej Memorial Hospital to upgrade its preventive health services through the adoption of technology.

Invest in AI and ML Platforms: To facilitate predictive analytics and decision support.

Run a Genomics Lab: For personalized assessment of health risk and targeted interventions.

Integrate Wearable Health Monitoring Devices: Continuously monitor patients for early warning systems.

Expand Telemedicine Services: Continue remote consultations and follow-up care.

Introduce Strong Training Programs: For health care professionals in new technologies and data management.

Conclusion

The use of advanced technology in preventive health check-ups at the Godrej Memorial Hospital indicates strong potential in finding and predicting diseases and improving the results for patients in India. The strategic integration of the technology will help Godrej Memorial Hospital achieve benchmarks in preventive health in India by improving the quality and efficiency of care given to the patients.

The existing medical system transformation is based on the assimilation of data and messaging mechanisms with software and hardware to provide an interlocking network for letting meaningful data to be transferred, significantly improved tracking of the recipient's clinical condition, and overarching reliability in medical services. This paper presented and give an outline of the opportunities that BD can help the health sector for information gathering in order to use the perspectives it can provide to construct an experience and understanding framework that allows patient personal health prognostications for a more accurate and appropriate medical system.

REFRENCES:

1. T. T. Chhowa, M. A. Rahman, A. K. Paul and R. Ahmmed, "Narrative Analysis on Deep Learning in IoT based Medical Big Data Analysis with Future Perspectives," 2019 International Conference on Electrical, Computer and Communication Engineering (ECCE),

2. A. Mir and S. N. Dhage, "Diabetes Disease Prediction Using Machine Learning on Big Data of Healthcare," 2018 Fourth International Conference on Computing Communication Control and Automation.

3. M. A. Sarwar, N. Kamal, W. Hamid and M. A. Shah, "Prediction of Diabetes Using Machine Learning Algorithms in Healthcare," 2018, 24th International Conference on Automation and Computing (ICAC).

4. P. S. Kumar and S. Pranavi, "Performance analysis of machine learning algorithms on diabetes dataset using big data analytics," 2017 International Conference on Infocom Technologies and Unmanned Systems (Trends and Future Directions) (ICTUS), 2017.

5. P. Bide and A. Padalkar, "Survey on Diabetes Mellitus and incorporation of Big data, Machine Learning and IoT to mitigate it, 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), 2020.

6. A. I. Ebada, S. Abdelrazek and I. Elhenawy, "Applying Cloud Based Machine Learning on Biosensors Streaming Data for Health Status Prediction," 2020 11th International Conference on Information, Intelligence, Systems and Applications (IISA)

7. A. Alahmar, E. Mohammed and R. Benlamri, "Application of Data Mining Techniques to Predict the Length of Stay of Hospitalized Patients with Diabetes," 2018 4th International Conference on Big Data Innovations and Applications (Innovate-Data).

8. U. Ahmed and C. Li, "Machine Learning for Diabetes Prediction," 2021 International Conference on Information and Communication Technology Convergence (ICTC).

9. S. N. Induja and C. G. Raji, "Computational Methods for Predicting Chronic Disease in Healthcare Communities," 2019 International Conference on Data Science and Communication (IconDSC).

10. V. Kedia, S. R. Regmi, K. Jha, A. Bhatia, S. Dugar and B. K. Shah, "Time Efficient IOS Application for Cardiovascular Disease Prediction Using Machine Learning," 2021 5th International Conference on computing Methodologies and Communication (ICCMC).

11. V. Vijayaganth; M. Naveenkumar, "4 Smart Sensor Based Prognostication of Cardiac Disease Prediction Using Machine Learning Techniques," in Applications of Machine Learning in Big- Data Analytics and Cloud Computing, River Publishers.

12. W. Wang, B. Jiang, S. Ye and L. Qian, "Risk Factor Analysis of Bone Mineral Density Based on Feature Selection in Type 2 Diabetes," 2018.IEEE International Conference on Big Knowledge (ICBK).

13. G. Sasubilli and A. Kumar, "Machine Learning and Big Data Implementation on Health Care data," 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS).

14. S. Pitoglou et al., "MODEL Health: Facilitating Machine Learning on Big Health Data Networks," 2019 41st Annual International
Conference of the IEEE Engineering in Medicine and Biology Society
(EMBC).

15. A. Ed-Daoudy and K. Maalmi, "Real-time machine learning for early detection of heart disease using big data approach," 2019 International Conference on Wireless Technologies, Embedded and Intelligent
Systems (WITS).

16. A. Sisodia and R. Jindal, "Exploring the Application of Big Data Analysis in Healthcare Sector," 2017 International Conference on
Computational Science and Computational Intelligence (CSCI)