HX8001 - PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

ANALYTICS FOR HOSPITALS HEALTH-CARE DATA

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ABSTRACTION

The main aim of this paper is to provide a deep analysis on the research field of healthcare data analytics. This paper is analyzing the previous studies and works in this research area, as well as highlighting some of guidelines and gaps. This study has used seven popular databases and selected most relevant papers, in order to conduct this paper. The paper has listed some data analytics tools and techniques that have been used to improve healthcare performance in many areas such as: medical operations, reports, decision making, and prediction and prevention system. Moreover, the systematic review has showed an interesting demographic of fields of publication, research approaches, as well as outlined some of the possible reasons and issues associated with healthcare data analytics, based on geographical distribution theme.

1. INTRODUCTION :

While healthcare management has various use cases for using data science, patient

length of stay is one critical parameter to observe and predict if one wants to improve the efficiency of the healthcare management in a hospital.

This parameter helps hospitals to identify patients of high LOS-risk (patients who will stay longer) at the time of admission. Once identified, patients with high LOS risk can have their treatment plan optimized to minimize LOS and lower the chance of staff/visitor infection. Also, prior knowledge of LOS can aid in logistics such as room and bed allocation planning.

1.1 PROJECT OVERVIEW :

Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus: Healthcare

Management. While healthcare management has various use cases for using data science, patient length of stay is one critical parameter to observe and predict if one wants to improve the efficiency of the healthcare management in a hospital.

This parameter helps hospitals to identify patients of high LOS-risk (patients who will stay longer) at the time of admission. Once identified, patients with high LOS risk can have their treatment plan optimized to minimize LOS and lower the chance of staff/visitor infection. Also, prior knowledge of LOS can aid in logistics such as room and bed allocation planning.

Suppose you have been hired as Data Scientist of Health Man – a not for profit organization dedicated to manage the functioning of Hospitals in a professional and optimal manner.

The goal is to accurately predict the Length of Stay for each patient on case by case basis so that the Hospitals can use this information for optimal resource allocation and better functioning. The length of stay is divided into 11 different classes ranging from 0-10 days to more than 100 days.

Technical Architecture:

1.2 PURPOSE:

Data analytics is being applied to manage labor costs in healthcare settings while simultaneously improving the quality of care patients receive and the efficiency of service provision. For example, Hawaii Pacific Health (HPH), one of the largest healthcare systems in Hawaii, was able to save $2.2 million over 16 months while maintaining high-quality outcomes by adopting a data-driven approach to labor management.HPH's paper-based management system was replaced with computer-generated visual representations of labor utilization that combined real-time views of staffing with graphical representations of staff levels. This transition gave managers greater insight into the productivity of individual workers and teams and the cost-effectiveness of staffing decisions, allowing the hospital to adjust staffing ratios in a way that reduced its labor costs without affecting the quality of care provided or patient outcomes.The automated labor management system cut the time managers spend on scheduling from four hours to only 15 minutes. The system also allows hospital staff to find answers to staffing and other questions in an instant rather than the two weeks required when using the paper-based approach to scheduling. Hundreds of workers at the hospital use the automated solution to manage their schedules and other employment-related resources.

2. LITERATURE SURVEY:

2.1 .EXISTING PROBLEM :

Data and analysis can go a long way, but health organizations must ensure that their data is used effectively. Due to the uniqueness of health data and its measurement difficulties, it is crucial to choose the right analytical technology for healthcare. On the other hand, to effectively manage health data, specialized technical teams, including data scientists and analysts, must be hired, which can be expensive depending on the size of the medical facility.

An important point is to give the relevant workers the resources and access to the data that will enable them to make data-based decisions and to ensure that the data they receive is as close to real time as possible.

Data and analysis can transform care, but the developers of these tools must be aware of the context in which they are used and health organizations must be willing to restructure elements of their practices to enable patients and providers to use data-driven care.

Health organizations face challenges with health data that fall into several broad categories, including data aggregation, policies, and process management. The biggest obstacle to the **implementation and application of data analysis in healthcare** is the fragmented landscape of the industry, with individual components each having their own incentives to deviate from what is best for the whole system. Patient and financial data are distributed across many paying agencies, hospitals, administrative offices, government agencies, servers and filing cabinets.

2.2 REFERENCES :

https://www.itcube.net/problems-that-data-and-analytics-can-help-solve-in-

healthcare/

www.itcube.net

2.3 PROBLEM STATEMENT DEFINITION :

The traditional methods of storing and retrieving such data are not efficient anymore, since it was structured and stored in data warehouses and relational databases, after extracting and loading it from different outside sources. We have proposed a healthcare analytics framework is composed of four phases which can give a better representation of medical features, and exploit the intrinsic information in data and therefore, benefit further data analytics performance.Sensor data [2] is ubiquitous in the medical domain both for real time and for retrospective analysis. Several forms of medical data collection instruments such as electrocardiogram, and electroencephalogram are essentially sensors that collect signals from various parts of the human body [32]. These collected data instruments are sometimes used for retrospective analysis, but more often for real-time analysis.

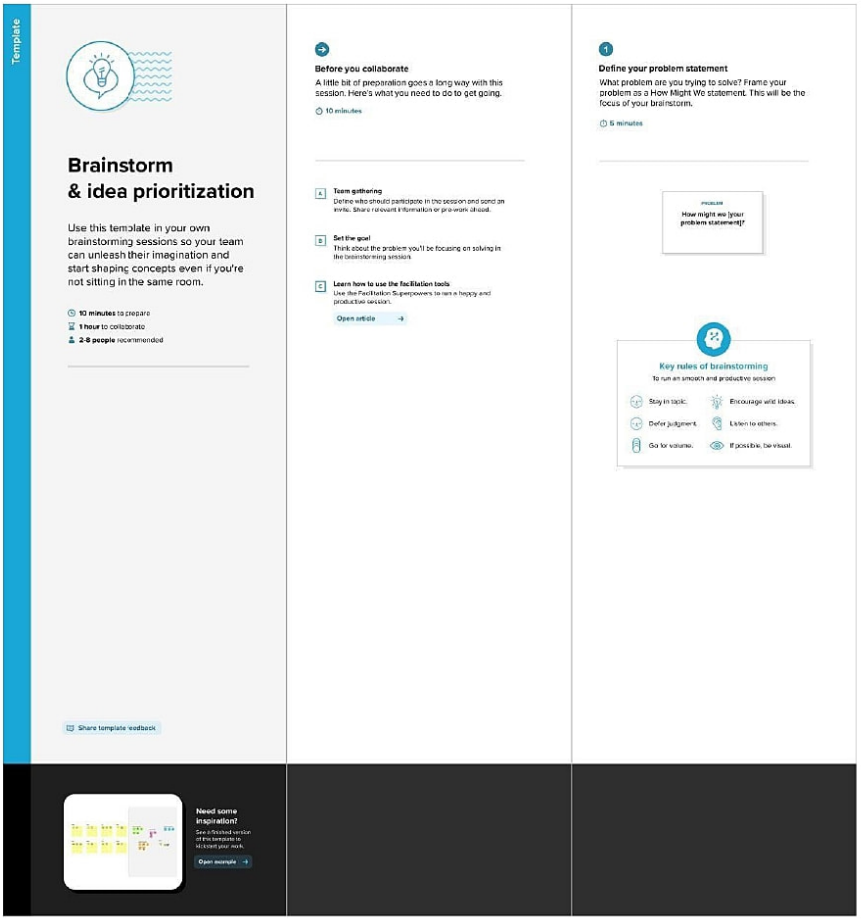
3. IDEATION & PROPOSED SOLUTION :

3.1 EMPATHY MAP CANVAS:

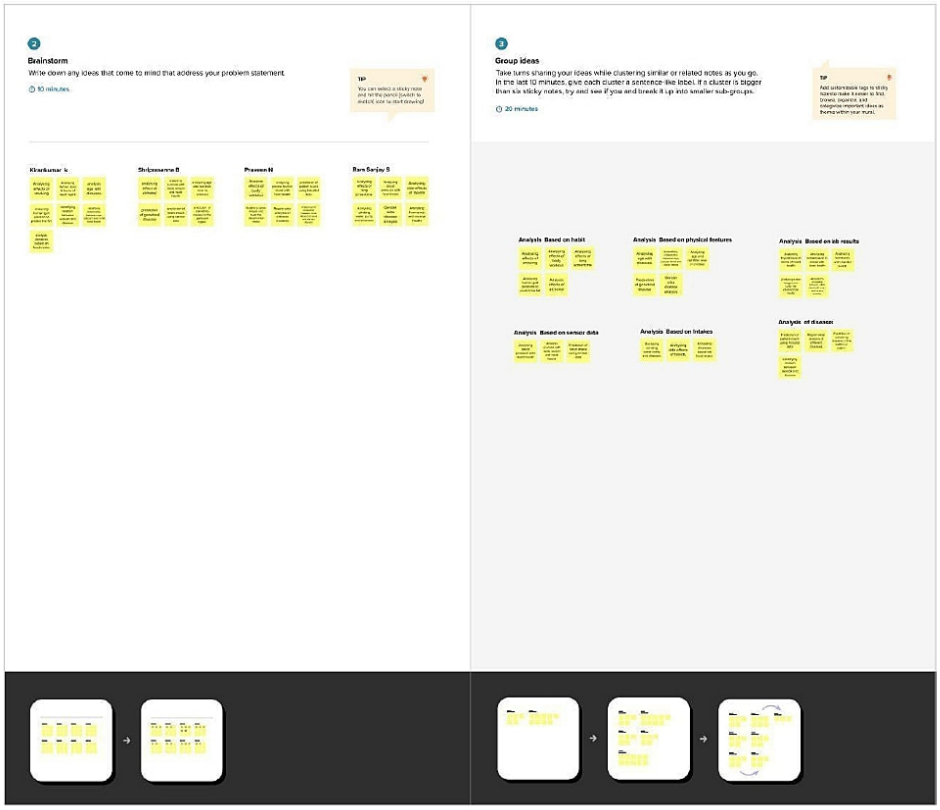
3.2 IDEATION & BRAINSTORMING :

BRAINSTROM & IDEA PRIORITIZATION

Step:1



Step:2



3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	EHR data matched patient-reported data in 23.5 percent of records in a study at an ophthalmology price Patients' EHR data did not agree in any way when the y reported having three or more eye health complaints.
2.	Idea / Solution description	☐ Predictive analytics can create patient journey dashboards and disease trajectories that can lead to effective, and result-driven healthcare. It improves treatment delivery, cuts costs,improves efficiencies,and so on.
3.	Novelty / Uniqueness	Healthcare data frequently resides in several locations. from various departments, such as radiology or pharmacy, to various source systems, such as EMRs or HR software. The organization as a whole contributes to the data. This data becomes accessible and usable when it is combined into a single, central system, such as an enterprise data warehouse (EDW).
4.	Social Impact / Customer Satisfaction	Enhanced diagnosis Improved medical treatmentImproved health results Improved relationships with patientsMore positive health indicators
5.	Business Model (Revenue Model)	The two factors that have the biggest negative effects on hospital income are claim denials and patient incapacity to pay their part. 90% claim denials were written off by hospitals and healthcare systems in 2017 compared to the preceding six years.

6.	Scalability of the Solution	A variety of institutions must store, evaluate, and take action onthe massive amounts of data being produced by the health care sector as it expands quickly. India is a vast, culturally varied nation with a sizable population that is increasingly able to healthcare services.

3.4 PROBLEM SOLUTION FIT:

1. Customer Segments + Hospital Management + Patients	**6. Customer Limitation** Can't assure the effective utilization andallocation of resources	**5. Available Solution**Text mining Information retrieval
1. **Problems/Pains** a. Proper allocation of resources b. Predicting the length of stay of COVID patients c. Proper utilization	**9. Problem** Efficient less calculationand prediction of occurring situations	**7. Behavior** Data tracking with available methodologies such astext mining and information retrieval

and treatment topatients

3. Triggers to Act
Prevailing emergencysituations and Pandemicperiod

4. Emotions
Tensed and perplexed mindset to get rectifiedfrom the pandemic period

10. YourSolution
Using predictiveanalysis powered by the Artificial intelligencewhich is used in analytics technique

8. Channels ofBehavior
1. Online: Usage of dataexploration

2. Offline: Preparing thedataset on the COVID patients.

4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENT:

FR No.	Functional Requirement(Epic)	Sub Requirement(Story/Sub-Task)
FR-1	**User Registration**	Registration through Application form
FR-2	**Use Confirmation**	Confirmation via OTP
FR-3	**Database**	Every patient has some necessary data like phone number, first and lastname, personal health number, country, address, city, patient's ID number, etc....
FR-4	**Report Generation**	The Hospital Management System generates a report on every patient regarding various information like patients name,phone number, room number, the doctor's name, and more. The Hospital Management system also helps in generating reports on the availability of the bed regarding information like bed numbers unoccupied or occupied, ward name, and more.

FR-5	**Check Out**	The staff in the administration sectionof the ward can check the patient's ID
		from the system and delete the patient's ID from the system when the patient checkout from the hospital.
FR-6	**Adding Patients**	The Hospital Management enables the staff at the front desk to include new patients in the system.

4.2 NON-FUNCTIONAL REQUIREMENTS:

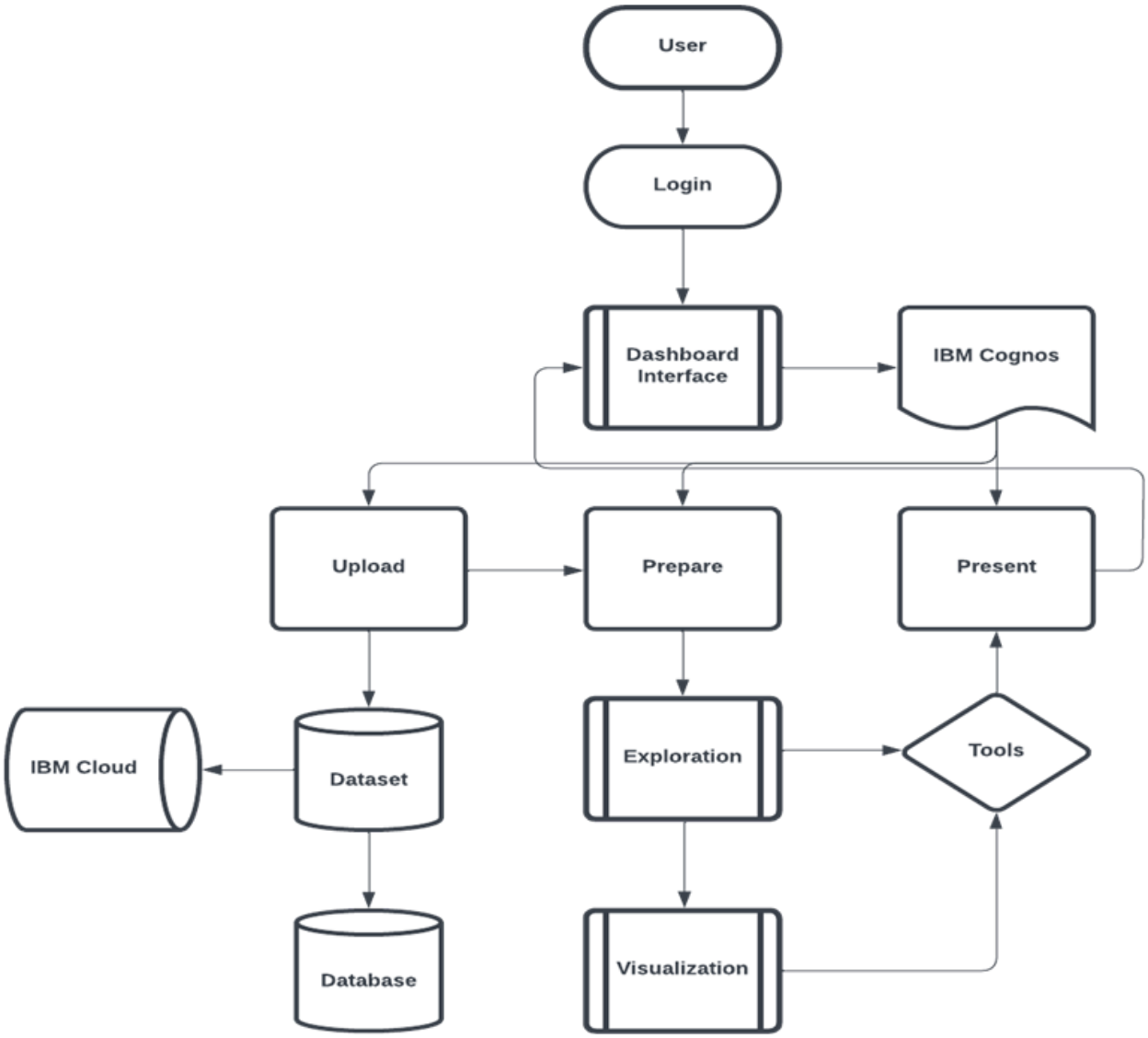
FR No.	Non-functional Requirement	Description
NFR-1	**Usability**	The effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment.
NFR-2	**Security**	This process of protecting data from unauthorized access and data corruption throughout its lifecycle.

NFR-3	**Reliability**	A highly reliable system has a lower risk of errors and process failures that can cause patients harm.
NFR-4	**Performance**	Performance measurements include: 1. Quality and efficiency of patient care. 2. Cost of healthcare services. 3. Disparities in performance 4. Care outcomes.
NFR-5	**Availability**	Inpatient, Outpatient, Pharmacy, and Enrollment
NFR-6	**Scalability**	The ability of a health intervention shown to be effective s on a small scale and under controlled conditions to be expanded under real world

		condition to reach a greater proportion of the eligible population.

5. PROJECT DESIGN :

5.1 DATA FLOW DIAGRAMS:



5.2 SOLUTION & TECHNICAL ARCHITECTURE:

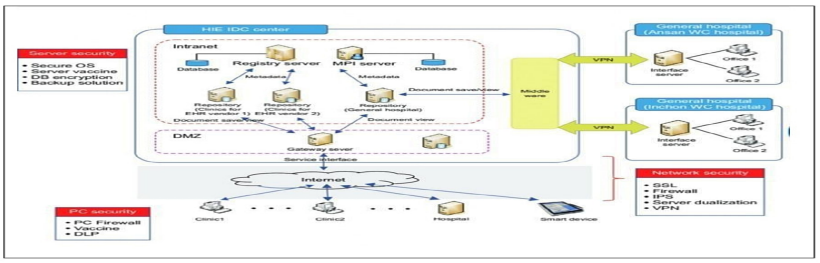


TABLE-1: COMPONENTS & TECHNOLOGIES:

S. No	Components	Description	Technology
1.	User Interface	How user interacts withapplication. Example:Mobile App	HTML, CSS, JavaScript,Excel
2.	Application Logic-1	Logic for a process in theapplication	IBM Watson STTservice, Python
3.	Application Logic-2	Logic for a process in theapplication	IBM WatsonAssistant
4.	Database	Data Type, Configuratio ns	MySQL, NSQL

5.	Cloud Database	Database service oncloud	IBM DB2, IBM Cloud ant
6.	File Storage	File Storage requirements	IBM Blocks Storage or other storage service or Local File system
7.	External API-1	Purpose of External APIused in the application	IBM Weather API
8.	External API-1	Purpose of External APIused in the application	Aadhara API
9.	Infrastructure (Server/Cloud)	Application Deploymenton Local System/Cloud Local Server Configuration:Cloud ServerConfiguration	Local, CloudFoundry

TABLE-2: APPLICATION CHARACTERISTICS:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of open-source framework
2.	SecurityImplementations	List all the security/access controls implemented, use of firewalls.	Example:SHA-256, Encryption, IAM Controls, OWASP
3.	Scalable Architecture	Justify the scalability of architecture	Cog nos Used
4.	Availability	Justify the availability of application (e.g:useof load balancers, distributed servers)	AWS Used
5.	Performance	Design consideration for the performance of the application (number of requests per second, use of Cache, use of	Dashboard,Reports,Stories

		CDN’s)		

5.3 USER STORIES:

User Type	Functional Requirement(Epic)	User Story Number	User Story / Task	Acceptancecriteria	Priority	Release
Customer (Mobileuser)	Registration	USN-1	As a user,I can register for the dashboard by entering my email, and password, and confirming my password.	I can access my accountin the dashboard	High	Sprint-1
		USN-2	As a user,I will receive a confirmation email once I have registered for the dashboard	I can receive a confirmation email &click confirm	High	Sprint-1
		USN-3	As a user, I can register for the dashboard through Social Media	I can register &access the dashboard with Social Media Login	Low	Sprint-2
		USN-4	As a user, I can register for the dashboard through Gmail	I can register and access dashboard with Gmail	Medium	Sprint-2
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login to the account in my email login.	High	Sprint-2

	Dashboard	USN-6	As a user ,I can use my account in my dashboard for uploading dataset.	I can login to the account for uploading dataset.	Medi um	Sprint-3
Customer (Webuser)	Website	USN-7	As a user ,I can use my dashboard in website	I can login into the dashboard by visiting website.	Medi um	Sprint-3
Customer Care Executive		USN-8	As a user ,I can contact Customer care Executive for my login.	I can contact customer executive for my login.	High	Sprint-4
Administrat or		USN-9	As a user ,I can contact administrator for myqueries.	I can contact administratorfor solving my queries.	High	Sprint-4
Exploration	Dashboard	USN-10	As a user, I can prepare data by using Exploration Techniques.	I can prepare data byusing Exploration Techniques.	High	Sprint-3
Presentati on	Dashboard	USN-11	As a user,I can Present data in my dashboar d.	I can present data byusing my account in dashboard.	High	Sprint-4
Visualizati on	Dashboard		As a user,I can Prepare Data by using Visualization Techniques.	I can prepare data byusing Visualization Techniques.	High	Sprint-3

6. PROJECT PLANNING & SCHEDULING:

6.1 SPRINT PLANNING & ESTIMATION:

MILESTONES	ACTIVITY LIST
MILESTONE-1	Collecting the data based on the application
MILESTONE-2	Uploading the collected data on the IBM COGNOS platform
MILESTONE-3	Data exploration in the IBMCOGNOS platform
MILESTONE-4	Data visualization in the IBMCOGNOS platform
MILESTONE-5	Creating an interactive dashboard
MILESTONE-6	Displaying the prepared dashboard
MILESTONE-7	Preparing a standard dataset and removing the unwanted data using the python programming
MILESTONE-8	By using the various algorithm and exploring the result and getting the accurateresult with the help of an algorithm which give more accuracy
MILESTONE-9	Displaying the result according to the required format for example displaying theLength Of Stay of a patient
MILESTONE-10	Deployed in theGitHub

6.2 SPRINT DELIVERY SCHEDULE:

Sprint	Functional Requirement (Epic)	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a health care provider I can create account inIBM cloud and the data a recollected.	20	High	2 Members
Sprint-2	Analyze	USN-2	As a health care provider all the data that are collected is cleaned and uploaded in the database or IBM cloud.	20	Medium	2 Members
Sprint-3	Dashboard	USN-3	As a health care provider I can use my account in my dashboard for uploading dataset.	10	Medium	2 Members
Sprint-3	Visualization	USN-4	As a health care provider I can prepare data for Visualization.	10	High	2 Members
Sprint-4	Visualization	USN-5	As a health care provider I can present data in my dashboard.	10	High	2 Members
Sprint-4	Prediction	USN-6	As a health care provider I can predict the length ofstay	10	High	2 Members

PROJECT TRACKER,VELOCITY & BURNDOWNCHART:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022

Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

VELOCITY:

Imagine we have a10-day sprint duration, and the velocity of the team is 20 (points per sprint).Let’s calculate the team’s average velocity (AV) per iteration unit (story points per day)

AV = SPRINT DURATION/VELOCITY
=10/20=2

6.3 REPORTS FROM JIRA:

7. TESTING:

7.1 TEST CASES:

The next step is test case design. Simply put, a test case is a testing artifact including a list of steps to be done and an expected result. Each test case corresponds with one usage scenario. In other words, a test case defines actions that a user should perform to check whether an application under test works as expected.The goal of this project is to " predict the potentially fraudulent providers " based on the claims filed by them. Along with this, we will also discover important variables helpful in detecting the behavior of potentially fraud providers. further, we will study fraudulent patterns in the provider's claims

to understand the future behavior of providers.

7.2 USER ACCEPTANCE TESTING:

We offer to start from the basics in order to be able to see and understand the whole scope of the issue. So, first of all, let's define what UAT is. UAT, an abbreviation for User Acceptance Testing, is a level of software testing that aims to reveal whether a software product is ready to be released. Except in rare circumstances, it is performed manually with the application of the black-box testing technique in the tail end of the QA process when all other tests have been successful completed. What sets UAT apart from other types of software testing is that it is carried out not by a QA team itself but by product owners, their representatives, BAs, subject matter experts, or a focus group of intended users.The key factor is domain expertise, a good understanding of the way an application should work, and testing from the perspective of end-users. By the time user acceptance testing is conducted, all technical issues must have been already detected and fixed. As a result, during this testing, the focus is shifted from a technical side to business-related issues. In other words, UAT is conducted with the purpose of validation, i.e. to make sure that an application matches all business requirements and satisfies real users' needs letting them efficiently and effectively solve their tasks.Only when user acceptance testing is successfully completed, it can be decided if an application can be released.As soon as requirements are utterly understood it is high time to get to designing a UAT plan. As a rule, it outlines a strategy to be applied as well as defines test scenarios, exit and entry criteria, deadlines, needed resources, test environment peculiarities, etc

8. RESULTS :

8.1 PERFORMANCE METRICS:

Hospital quality metrics are a set of standards developed by CMS to quantify healthcare processes, patient outcomes and organizational structures.

In value-based payment models, quality metrics are used to adjust provider reimbursement rates, offering a bonus in the event of above-average ratings or a penalty for failing to meet standards.

Below we've listed the top 10 essential hospital metrics to track, with examples from Definitive Healthcare’s comprehensive healthcare commercial intelligence.

1. LENGTH OF STAY:

Length of stay measures the length of time between a patient's admittance to and discharge from a hospital. This metric is most often tracked over months and annual quarters, though it can also be tracked over the course of a few weeks. Length of stay measurement can be examined for an entire hospital or a specific therapy area, such as acute myocardial infarction s (AMIs).

This data is important because it quantifies care efficiency over time. Longer patient stays are associated with greater risk of hospital-acquired infections (HAIs) and other hospital-acquired conditions (HACs), as well as higher patient mortality rates.Interestingly, cardiac patients are an exception to this rule. Those admitted for heart failure see lower mortality rates with shorter hospital stays, but higher readmission rates. As with other conditions, there is a risk of releasing patients too early and overlooking potentially life-threatening complications.

Patient length of stay also impacts hospital financial performance. Naturally, the longer a patient stays at a hospital, the more money is required to care for them. In addition to patient care costs, CMS incentivizes shorter patient stays where possible, offering financial bonuses to reduce the time patients spend in hospitals

for an episode of care.

2. READMISSION RATES:

Readmission rates track the percentage of patients that are admitted into the same or another hospital within 30 days of being discharged for the same condition—or a complication from the original episode of care. This metric measures the quality of care given to patients. High hospital readmission rates indicate that physicians and other care providers are not delivering the proper care to patients, overlooking complications or relevant patient data. Lower hospital readmission rates, by extension, indicate a strong quality of care.

The average all-cause hospital readmission rate in 2021 is 15.5% according to Definitive Healthcare data (most recent data available). Pittsburgh VA Medical Center (PA) had the highest all-cause readmission rate at 21.2% — more than one in five patients was readmitted to a hospital within 30 days of discharge. New York's Hospital for Special Surgery had the lowest readmission rate with 11.5%.

High readmission rates could also be a detriment to hospital financial performance. Hospitals with the highest readmission rates may not receive full Medicare reimbursement payments as a penalty. Walking the line between short patient stays and low readmission rates is a difficult task, but it is important for patient health as well as hospital financial health.

3. HCAHPS:

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey measures 64 markers of patient satisfaction. Topics included in the survey range from care quality to cleanliness of the care facility. Results from the survey are released as star ratings on a scale of 1 to 5, with 5 being the best possible score. HCAHPS scores provide actionable data on how hospitals can

improve patient care and services offered.

Most criticisms of the HCAHPS system center around the simplistic manner of the star system. Hospital leaders argue that the ratings are misleading, as they do not always provide the whole picture of patient care. Similarly, experts expressed concern that hospitals serving poor and high-risk populations are unfairly penalized through this system—particularly hospitals with high patient volume. Average daily census refers to the mean number of patients admitted to the hospital every day.

According to Definitive Healthcare data, of the 3,110 hospitals that received an HCAHPS star rating, only 178 hospitals achieved 5 stars — about 5.7%. Roughly 28% received a 4-star rating (886 hospitals) in 2021.

4. MORTALITY RATES:

Patient mortality rate measures the percentage of patients who die in a hospital's care before being discharged. This metric is a strong indicator of providers' ability to stabilize a patient's condition following surgery or another procedure.

According to Definitive Healthcare data, the average heart attack mortality rate is 12.6% in 2021 (most recent data available). Doctors Medical Center Modesto (CA) and Franciscan Health Dyer (IN) tied for the highest heart attack mortality rate with 16%. Mayo Clinic Hospital – Saint Mary’s Campus had the lowest mortality rate with 8.7%.

5. BED UTILIZATION RATE:

Bed utilization rate (also called bed occupation rate) refers to the number of hospital beds being used at any given time. Knowing bed demand in real time is important to providers who need to know the difference between available beds

and patients awaiting care.

Balancing bed availability can be difficult. If occupancy is too low, the hospital is likely losing money through unnecessary staffing and facility maintenance. If occupancy is too high, care quality could decline because there aren't enough clinicians to care for the admitted patients. According to Definitive Healthcare data, the average bed occupancy rate is 49.9%. The rate is higher for urban hospitals than for rural hospitals. Urban hospitals have an average bed utilization rate of 57%, while rural hospitals have an average rate of 36%.

6. INCIDENTS:

Hospital incidents include unintentional consequences or side effects of hospital procedures, including conditions like sepsis, postoperative respiratory failure, pulmonary embolisms, hemorrhages and other reactions or infections. This metric measures the ability of healthcare professionals to provide comprehensive, high-quality care to patients without triggering an adverse reaction.

Tracking hospital incidents is vital to understanding the quality of care a facility is providing. Incidents provide hard data on what steps a hospital should take to improve its services as well as reduce patient mortality and readmission rates. According to Definitive Healthcare data, 758 hospitals reported receiving a penalty for hospital-acquired conditions in fiscal year 2021.

7. CMS PROGRAM PERFORMANCE:

CMS spearheads dozens of initiatives aiming to reduce overall healthcare costs and improve care quality across the country.

Some of these programs, like the Medicare Shared Savings Program, target accountable care organizations (ACOs). Others, like Fee-For-Service Part B, target hospital spending. Regardless of the target facility or organization, CMS’s value-

based programs offer financial rewards for improvement on a variety of clinical and quality metrics.

Participation in these programs can lead to improvement in care quality, efficiency, technology use and more. CMS incentive programs serve as beta tests to improve care delivery while lowering costs. In addition to the obvious financial incentives, participating facilities also have a plethora of data to analyze in order to improve on the most relevant measures.

8. AVERAGE COST PER DISCHARGE:

Tracking the average care costs per patient discharged can aid hospitals in understanding which therapy areas see overspending. Similarly, this metric shows where hospitals make the greatest profit as well as whether the costs associated with patient care actually improved the patient's outcome. Cost per discharge is a dynamic measure that can be adjusted for a hospital's case mix and other patient population demographics.

Tracking this metric can help hospitals understand long-term spending by therapy area and adjust care provision accordingly. Over time, high care costs and low profits can negatively impact hospital performance and care offerings, reducing the variety of services available and physicians on staff.

9. OPERATING MARGIN:

A hospital's operating margin refers to the facility revenue after subtracting operating costs such as wages, medical equipment and supplies, rent and other expenditures. To remain operational, hospitals must be able to pay these fixed costs without going into debt.

According to Definitive Healthcare data, the average hospital net operating margin is -16.4%, meaning that most U.S. hospitals are not turning a profit. Of hospitals

with a positive operating margin, the average is 14.9%. Hospitals with a negative operating margin averaged -38%. Of the 6,600 active hospitals that report margins tracked by Definitive Healthcare, 12 reported a profit margin of 0%.

10. BAD DEBT:

Bad debt refers to revenue loss that occurs when a hospital requests payment from a patient for care provision and does not receive the full amount.

Under the original guidelines, any lack of repayment was reported as bad debt. As of January 2019, bad debt is only valid if there was an event in a patient's life, such as unemployment, that led to the inability to pay for their care.

A high bad debt ratio can impact the amount of charity care a hospital is able to provide to patients. Bad debt also negatively impacts hospital revenue, restricting available services.

According to Definitive Healthcare data, the average bad debt to net patient revenue ratio is 7.2%. Only seven of the 5,950 hospitals reporting bad debt claimed a negative ratio. Of those seven, five hospitals also reported a negative net patient revenue.

10. ADVANTAGES & DISADVANTAGES:

PREDICTIVE MEDICINE:

Big data algorithms are structured to assist doctors in carrying out more accurate clinical diagnostics. The customized solutions can process large data working with prognostic analytics, and predictive modeling techniques. Big data analytics helps to detect diseases at the early stage and make suggestion for the right treatments.

TELEMEDICINE:

Telemedicine is the application telecommunication technology in rendering healthcare service remotely. This type of medical service delivery has been around for over 40 your now, but with the revolution in smart technology for online video call, smartphone, mobile apps etc telemedicine is now gaining more prominence in healthcare industry.

CHALLENGES OF BIG DATA IN HEALTHCARE:

Big data analytics have been quite helpful in healthcare industries in offering quality and efficient healthcare delivery in the areas of preventing diseases, predicting medical outcome, reducing medical errors, and boosting all aspect of healthcare. Nevertheless, there remain some underlining disadvantages and challenging discouraging healthcare providers from applying big data technologies in their healthcare delivery operations.

MAN POWER:

Applying big data solutions in healthcare requires special skills, and such kills are scarce. Handling of big data requires the combination of medical, technological and statistical knowledge.

PRIVACY:

One of the major drawbacks in the application of big data in healthcare industry is the issue of lack of privacy. Application of big data technologies involves monitoring of patient's data, tracking of medical inventory and assets, organizing collected data, and visualization of data on the dashboard and the reports. So visualization of sensitive medical data especially that of the patients creates negative impression of big data as it violets privacy laws. Big data gives doctors unhindered access to a patient's private records from anywhere, and this does not give the patient any freedom. Medical big data experts have said that technology takes ways one's privacy for greater good.

DATA SAFETY:

Data security is another challenge in applying big data in healthcare. Big data storage is usually targets of hackers. This endangers the safety of medical data.

Healthcare organizations are very much concerned about the safety of patients' sensitive personal data.

REPLACING MEDICAL PERSONNEL:

Application of technology in every sphere of human life is improving the way things are done. These technologies are are also posing some threat to world of works. Robotics are replacing human labor. In same manner, customized solutions like big data could take over the jobs of medical personnel. Although big data has not gotten to the point where it can auto-run itself and lacks personal touch of doctors, but as technologies advance, robotics can begin to perform some, functions of doctors and other healthcare providers.

10. CONCLUSION:

Nowadays, various biomedical and healthcare tools such as genomics, mobile biometric sensors, and smartphone apps generate a big amount of data. Therefore, it is mandatory for us to know about and assess that can be achieved using this data. For example, the analysis of such data can provide further insights in terms of procedural, technical, medical and other types of improvements in healthcare. After a review of these healthcare procedures, it appears that the full potential of patient-specific medical specialty or personalized medicine is under way. The collective big data analysis of EHRs, EMRs and other medical data is continuously helping build a better prognostic framework.

11. FUTURE SCOPE:

The companies providing service for healthcare analytics and clinical transformation are indeed contributing towards better and effective outcome. Common goals of these companies include reducing cost of analytics, developing effective Clinical Decision Support (CDS) systems, providing platforms for better

treatment strategies, and identifying and preventing fraud associated with big data. Though, almost all of them face challenges on federal issues like how private data is handled, shared and kept safe. The combined pool of data from healthcare organizations and biomedical researchers have resulted in a better outlook, determination, and treatment of various diseases. This has also helped in building a better and healthier personalized healthcare framework. Modern healthcare fraternity has realized the potential of big data and therefore, have implemented big data analytics in healthcare and clinical practices. Supercomputers to quantum computers are helping in extracting meaningful information from big data in dramatically reduced time periods. With high hopes of extracting new and actionable knowledge that can improve the present status of healthcare services, researchers are plunging into biomedical big data despite the infrastructure challenges. Clinical trials, analysis of pharmacy and insurance claims together, discovery of bio markers is a part of a novel and creative way to analyze healthcare big data.

12. APPENDIX:

SOURCE CODE:

https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2FProject%2FA&action=view&mode=dashboard&subView=model0000018445e385f4_00000002

GITHUB :

IBM-Project-43466-1660717115

PROJECT DEMO LINK:

https://drive.google.com/file/d/1UT080dsfPy_1r4yY15UaTCbGS3fp6aDg/view?usp=sharing