Healthcare Provider Leveraging Analytics to Improve Patient Care

Course Title:	CS504049 – Business Intelligence (BI)
Instructor:	Phuc H. Duong
Location:	Tan Phong Campus

Background

A large healthcare provider, HealthyCare, operates several hospitals and clinics across the region. In recent years, HealthyCare has faced challenges related to managing increasing patient volumes, improving treatment outcomes, and optimizing resource utilization. To address these issues, the healthcare provider implemented an advanced Business Intelligence (BI) system to utilize Descriptive, Predictive, and Prescriptive Analytics for enhancing patient care and operational efficiency.

Descriptive Analytics

HealthyCare's BI system aggregates data from patient records, hospital admissions, and medical procedures to provide a detailed understanding of past healthcare trends. Descriptive Analytics is used to analyze patient demographics, disease patterns, and hospital utilization rates. For example, the system identifies that there has been an increase in the number of elderly patients admitted for chronic conditions such as diabetes and hypertension.

Key insights from Descriptive Analytics:

- **Patient Demographics**: A 30% increase in elderly patients over the past 3 years.

- **Disease Trends**: A consistent rise in cases of diabetes, especially in urban areas.

- **Hospital Utilization**: Peak hospital admissions occur during the winter flu season.

Predictive Analytics

With Predictive Analytics, HealthyCare forecasts future patient trends and potential health risks. By analyzing historical patient data and external factors (e.g., seasonal patterns), the BI system predicts which patients are at higher risk of readmission and which treatments are likely to lead to better outcomes. For example, the system predicts that patients with chronic heart conditions who do not attend follow-up appointments are more likely to be readmitted within three months.

Key insights from Predictive Analytics:

- Elderly patients with diabetes have a 25% higher risk of complications during winter months.

- Patients who miss more than two follow-up appointments have a 40% higher chance of readmission within 90 days.
- Predicting a spike in respiratory infections during the upcoming flu season, based on past trends and current weather data.

Prescriptive Analytics

HealthyCare uses Prescriptive Analytics to recommend specific actions that can prevent health complications and optimize resource allocation. For example, based on the predictions of a rise in flu cases, the system recommends increasing flu vaccine stock and scheduling additional staff during peak periods. It also suggests personalized care plans for high-risk patients, such as sending reminders for follow-up appointments or recommending lifestyle changes to improve patient health outcomes.

Key actions from Prescriptive Analytics:

- Allocate additional nursing staff and beds for the predicted increase in flu-related hospitalizations.
- Send automated appointment reminders to patients at high risk of missing follow-ups.
- Increase orders for flu vaccines and prioritize vaccination for elderly patients before the winter season.

Case Study Questions

1. Descriptive Analytics:

a. What data sources does HealthyCare use to perform Descriptive Analytics?

b. How does Descriptive Analytics help HealthyCare understand trends in hospital admissions?

c. Why is it important for HealthyCare to track the rise in chronic conditions such as diabetes?

2. Predictive Analytics:

a. How can Predictive Analytics help HealthyCare forecast patient admissions during the flu season?

b. What are the benefits of predicting which patients are at a higher risk of readmission?

c. In what other ways could HealthyCare use Predictive Analytics to improve patient outcomes?

3. Prescriptive Analytics:

a. How does Prescriptive Analytics guide HealthyCare in preparing for a predicted increase in flu cases?

b. Discuss how HealthyCare can use Prescriptive Analytics to prevent readmissions by high-risk patients.

c. What other prescriptive recommendations could HealthyCare implement to improve overall hospital efficiency?

4. Overall Application:

a. How can the combination of Descriptive, Predictive, and Prescriptive Analytics help HealthyCare improve patient care and reduce operational costs?

b. In what ways could HealthyCare's use of analytics lead to better patient satisfaction and treatment outcomes?

c. What are some challenges HealthyCare might face when relying heavily on analytics for decision-making in healthcare?