

Rahul Raj Yadav

Y00784345

Project Title: Hospital Record Database Faculty

Coach: DR. ROBERT A GILLILAND

**Abstract:**

This comprehensive study delves into the specifics of enhancing a hospital database system through meticulous data collection, management, and visualization. The stated problem relates to inefficiencies in the current data infrastructure, which negatively affect patient care and the hospital's daily operations. The recommended solution employs a multifaceted strategy to enhance operational effectiveness and decision-making processes. Tableau is used for perceptive data display, while SQL is used for database management.

**Problem Definition**:

The hospital is now battling data management problems, including subpar reporting capabilities, slow query response times, and difficulties identifying certain patient data. The hospital's needs are growing, and the current database system isn't keeping up with them. Inefficient data handling procedures have an impact on the daily operations of the hospital as well as the quality of patient care and the decision-making procedures.

The proposed solution involves a comprehensive overhaul of the hospital's database system, utilizing SQL for effective data management and Tableau for visualizing the collected data. The key steps in the solution include:

Data Collection from Various Sources:

The data for our project has been obtained through Associate Professor in Criminal Justice and in statistics and Human Health Services Department at Youngstown State University. And we created a database in SQL using these data sets we were able to obtain.

Several papers with text

Description automatically generated

Fig: Raw Data sets

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

Fig: Hospital Database

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

Fig: Importing the data from file Conditions and Encounters in Database

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

Fig: Importing Data for files Immunizations and Patients in Database

Optimal timing for flu vaccination typically occurs in the early fall, around September or October, allowing individuals to build immunity before the virus becomes widespread. So, we decided to use variables from our dataset and use Queries to join tables and modify datasets accordingly which could be used in our Visualization.

In relational databases, SQL joins are essential for effectively organizing and evaluating data across multiple tables. Data integration is made smooth by using joins, which enable the combination of different datasets based on shared attributes. Through this integration, redundant data is avoided, and an organized method of information organization is made possible. When working on sophisticated queries that require pulling data from numerous sources, SQL joins shine. When working with huge datasets, the database engine's optimization for join handling guarantees better query speed than manual processing. A sturdier and more dependable database is produced using joins, which also makes it easier to enforce referential integrity through relationships between tables.

With the use of SQL joins, comprehensive patient records including demographic information, medical history, and related operations can be created. With the help of this integration, medical practitioners may make decisions more quickly and accurately by having access to a consolidated view of patient data in a single query. Furthermore, the linkages between tables in a hospital database are essential to preserving data integrity. To avoid inconsistencies or orphaned data, foreign key restrictions, for example, might be used to create relationships between patient records and the relevant processes or doctors through SQL joins.

Large amounts of healthcare data must be managed efficiently, and SQL joins offer an organized method. This is especially clear when producing reports that need information from several sources, like putting together a thorough patient history report or comparing how several doctors conduct a given medical treatment. A hospital database can be made more scalable, flexible, and capable of meeting changing healthcare demands by utilizing SQL joins. Additionally, healthcare personnel can benefit from a more accurate and unified representation of patient data for better clinical decision support.

Using Encounter, Patients and Immunizations table from our dataset we will create a new csv file that can be only used to make visualization in our tableau for Flu shots. Query extracts relevant information about flu shots and patients, and export the result as a CSV file:

A close-up of a document

Description automatically generated

A screenshot of a computer

Description automatically generated

A screenshot of a computer

Description automatically generated

**Data Visualization with Tableau**

For a data visualization project, there are various benefits to choose the topic of flu vaccines. The topic is particularly topical and powerful because flu vaccines are a crucial part of public health. The yearly schedule of flu shots offers a dependable dataset that enables comparisons and trend analysis across time. Flu vaccinations also consider several demographic variables, including age, race, and geography, which opens new scope for research and focused interventions. Furthermore, because the subject is in line with more public health objectives, healthcare providers, decision-makers, and the public can apply and utilize the findings. The emphasis on flu vaccinations also adds to the ongoing global discussion on infectious disease prevention by highlighting the value of immunization in reducing the incidence of seasonal infections.

We used data from a hospital database to provide a comprehensive depiction of flu vaccines for the year 2022 in this Tableau data visualization project. A CSV file was created by running SQL queries on the Encounter, Patients, and Immunizations tables; this file served as the basis for the Tableau visualization. Important patient data, including demographics and flu shot history, are included in the CSV file to enable a more thorough analysis of flu vaccination trends. We created illuminating visuals in Tableau using patient identities, names, gender, race, birthdates, county data, age, and flu shot status. These map-based visualizations provide a comprehensive view of vaccination coverage by showing the stratified percentages of patients receiving flu vaccinations by age, race, and county. We also included a list of patients with their flu vaccination status, the total number of flu shots administered, and a running total of the flu shots given throughout the year. This method not only makes flu shot data easier to convey, but it also allows for dynamic and interactive exploration, which gives stakeholders and healthcare professionals the information they need to make well-informed decisions about public health strategies and interventions.

Importance:

Enhanced Decision-Making:

The optimized database and visualized data will empower hospital administrators and healthcare professionals to make informed decisions promptly.

Improved Patient Care:

Streamlined data retrieval will lead to faster diagnosis, treatment, and overall improvement in patient care quality.

A screenshot of a medical report

Description automatically generated

**Data Visualization with Tableau**

(Emergency Room Dashboard)

A dashboard in an emergency room (ER) is a device that shows data on numerous operational aspects of the facility in real-time or almost real-time. It facilitates the monitoring and management of patient care, resource use, and overall efficiency by administrators and healthcare professionals.

Data source:

To build Emergency room dashboard, I reached out to Human Health services for Data source and Professor from my clinical informatics class she provided me with a sample data set.

A close-up of a document

Description automatically generated

An emergency department's (ER) dashboard is a graphic representation of important metrics and statistics that are pertinent to the department's performance and operations. To guarantee effective and efficient patient care, this tool assists administrators and healthcare professionals in managing and monitoring a variety of factors. The following describes some typical components that you may see on an emergency room dashboard:

Heat Map:

A heat map is a graphic display of data that uses colors to represent values. A heat map could be used to show the distribution of specific conditions or the current state of patient flow in the context of an emergency room dashboard.

For instance, varying hues could stand for the seriousness of a patient's condition or the amount of traffic in various ER sections. Longer wait periods or higher acuity may be indicated by darker hues.

Patient Wait Time:

This statistic calculates the amount of time a patient must wait from the moment they enter the emergency department until they are seen by a medical professional or receive initial care.

The wait times distribution, maximum wait times, and average wait times could all be shown on the dashboard. It aids medical practitioners in locating ER process bottlenecks and potential improvement areas.

Patient Satisfaction Score:

After an ER visit, patients commonly fill out surveys or feedback forms to provide a patient's level of satisfaction.

A trend or total score over time may be shown on the dashboard. To assess the quality of care and pinpoint areas where the patient experience needs to be improved, it is imperative to monitor patient satisfaction.

Patients Wait Time:

This measure shows the total number of patients seen in the ER over the course of a given period or the total number of patients seen overall.

Monitoring the overall number of patients assists medical staff in determining the ER's capacity and workload. Decisions on hiring and allocating resources can also benefit from it.

A screenshot of a medical dashboard

Description automatically generated