Analysis of Hospital Stay in Diabetic Patients

Insights from a decade of clinical records (1998 – 2008)

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Introduction

The dataset, "Diabetes.xlsx" is a subset of the complete [Diabetes 130-US hospitals for years 1999-2008]. It contains medical records from 130 US hospitals dating back a decade (1999-2008). Each record highlights diabetic patients who underwent laboratory testing, took medication, and were hospitalized for up to 14 days.

The main objective of the analysis is to identify variables that may influence the length of hospital stay for diabetic patients. This includes understanding the average hospital stay and how that specific metric may differ with respect to other characteristics including race, age, gender, or medication. Understanding these metrics is critical as longer hospital stays critically influences patient outcomes and medical expenses. Overall, the goal is to acquire insights that may influence minimizing hospital stays and effectively allocating medical resources. By analyzing patient demographics and diabetic medication, we aim to enhance patient health and reduce medical expenses.

The analysis of hospital stay in Diabetic Patients aims to answer the following questions:

1. What is the typical duration of hospital stays for diabetic patients?
2. How does the length of stay differ concerning admission types?

Excel Analysis

In the following analysis, we leverage Excel's features to analyze and comprehend the diabetes dataset using pivot tables and summary statistics. Pivot tables allow us to dynamically organize

and summarize the data, resulting in a clear and simple perspective of significant trends and patterns. Furthermore, the summary statistics include key metrics like mean, median, mode, variance, and standard deviation, providing an overview of the dataset's primary features.

time_in_hospital	
Mean	4.398454147
Standard Error	0.00946972
Median	4
Mode	3
Standard Deviation	2.98697235
Sample Variance	8.922003822
Kurtosis	0.845957215
Skewness	1.133256483
Range	13
Minimum	1
Maximum	14
Sum	437611
Count	99492

Based on the **summary statistics** of the 'time_in_hospital' variable, the average time spent in the hospital is 4.40 days, the midpoint of the distribution 4 days, and the most reoccurring days spent in the hospital is 3 days across gender, race, and age. Additionally, both the sample variance and standard deviation measure the spread/dispersion of the time spent in the hospital. The sample variance of 8.92 indicates a wide spread of days spent in the hospital and the standard deviation of 2.99 indicates a large dispersion indicating the data points are far from the mean.

Row Labels ⌄	Count of Patients	Avg. Time in Hospital	Avg. Time in Hospital (%)
AfricanAmerican	19210	4.51	102.49%
Caucasian	76099	4.39	99.71%
Other	1505	4.28	97.21%
Hispanic	2037	4.06	92.30%
Asian	641	4.00	90.83%
Grand Total	99492	4.40	100.00%

Regarding race, the pivot table addresses each group's respective time spent in the hospital. Based on the data, we can interpret that Caucasians make up the majority of the population, with a total count of 76,099 patients and an average hospital stay of 4.4 days. African Americans, on the other hand, come second with a patient count of 19,210 and possess the highest average hospital stay of 4.5 days. Recognizing these patterns helps hospitals allocate resources effectively by ensuring the necessary support is available for patients.

Row Labels ⌄	Count of Patients	Avg. Time in Hospital	Avg. Time in Hospital (%)
[80-90)	16800	4.804345238	109.23%
[90-100)	2724	4.744860499	107.88%
[70-80)	25468	4.595610177	104.48%
[60-70)	21988	4.387165727	99.74%
[50-60)	16895	4.128973069	93.87%
[40-50)	9465	4.046064448	91.99%
[30-40)	3699	3.802919708	86.46%
[20-30)	1611	3.568590937	81.13%
[10-20)	682	3.208211144	72.94%
[0-10)	160	2.55	57.97%
Grand Total	99492	4.398454147	100.00%

The pivot table provides insight on the correlation between older diabetic patients and time spent in the hospital. Based on the data specified through the pivot table, the age range of [70-100] spent longer days in the hospital on average. On a detailed level, the age range of [70-80] spent an average of 4.6 days in the hospital, age range [90-100] spent an average of 4.7 days in the hospital, and age group [80-90] spent the most time in the hospital with an average of 4.8 days. The data provides insights into the needs for elderly diabetic patients and the optimization of their care.

Row Labels	Count of Patients	Avg. Time in Hospital	Avg. Time in Hospital (%)
Female	53575	4.479832011	101.85%
Male	45917	4.303504149	97.84%
Grand Total	99492	4.398454147	100.00%

In terms of gender, the pivot table suggests that female patients spend an average of 4.5 days (101.85%) in the hospital, while male patients spend 4.3 days (97.84%). This suggests that female patients typically had longer hospital stays. Furthermore, females make up majority of the patient population with a count of 53,575 while male patients make up 45,917 of the population. As a result, the data evidently displays the need for gender specific diabetic treatment to meet the specific needs of each patient.

Tableau Analysis

Next, in this analysis, we utilize Tableaus visualization tools to acquire insights into diabetic patients' hospital stays. The first visual captures the correlation between the average time in the hospital by admission id, including trauma center, urgent, emergency, elective, newborn, and other.

This visual allows us to analyze and compare how different hospital admissions influence the duration of stay. The second visual displays the average time spent in the hospital in regard to whether patients are on diabetic medication or not. By analyzing both visuals, we aim to identify trends and patterns to improve patient outcomes.

Average Time in Hospital by Admission
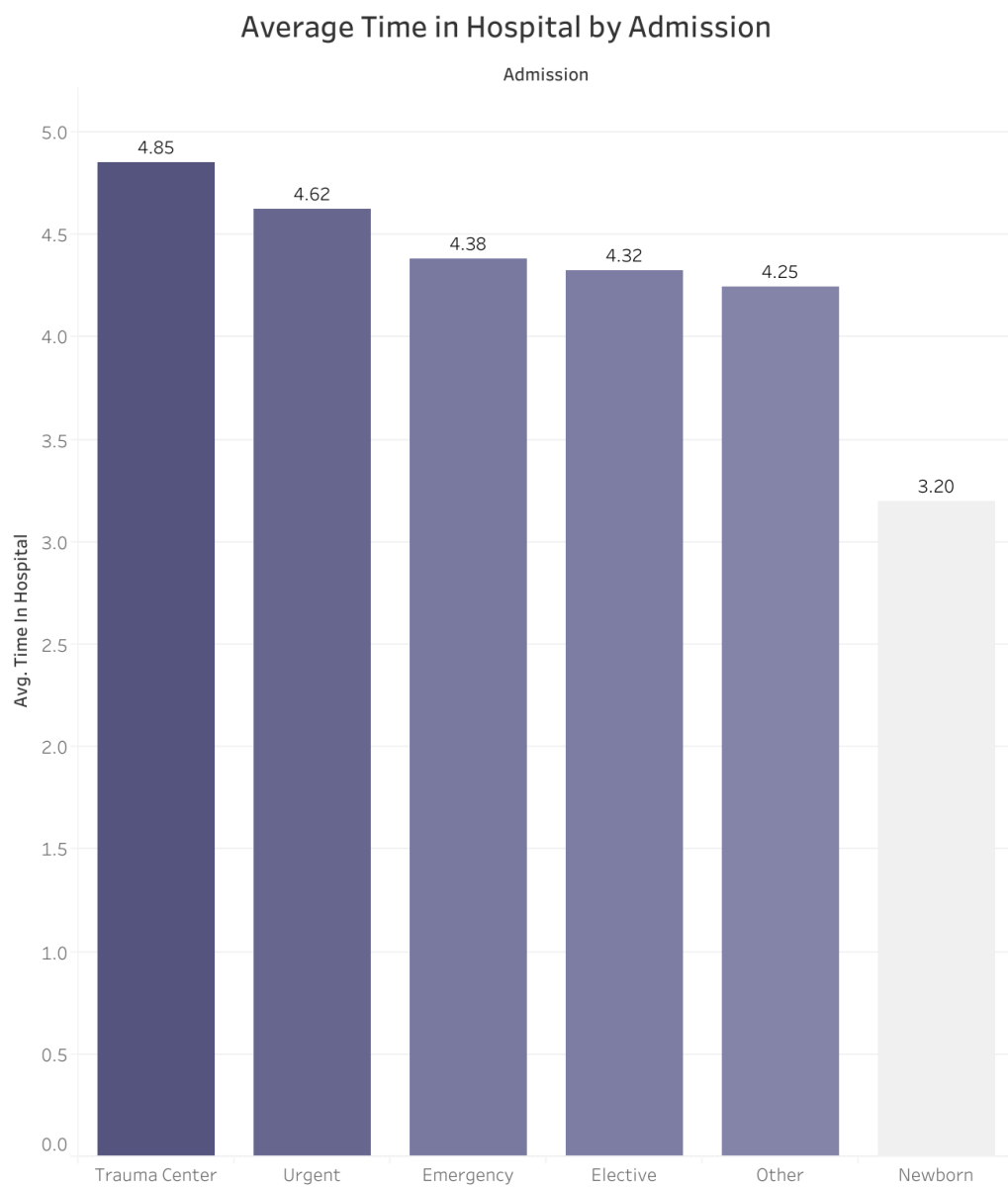
Admission

- ***Dimensions: Admission ID = Trauma Center, Urgent, Emergency, Elective, Newborn, Other.***

- ***Measures: Average Time in Hospital = AVG(Time in Hospital).***

In terms of average time in hospital by admission, the visualization shows that patients spend an average of 4.8 days in the trauma center, 4.6 days in Urgent care, 4.3 days in Emergency, 4.32 days in elective, 4.2 days in other, and 3.2 days for newborns. This data suggests that many patients spend the majority of their days inside the Trauma center and Urgent care the most. Furthermore, this can indicate that the majority of the severe medical problems may be solved in those places. While Emergency, Elective and other might not need to stay as long for their medical issue. Newborns spend the least amount of time in hospital, which can mean that they generally do not need to stay as long only if there are medical problems or complications.

Average Time in Hospital by Diabetes Medication
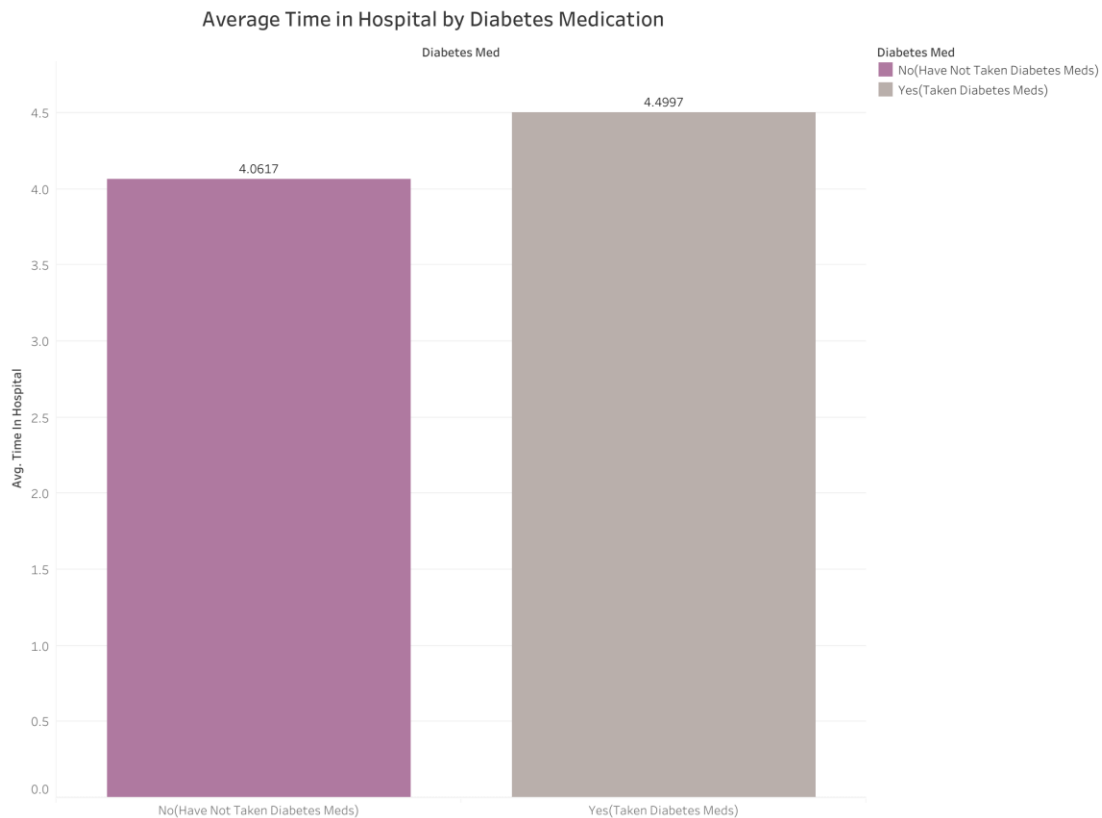
- ***Dimensions: Diabetes Medication = Yes (Have Taken Diabetes Medication, No (Have Not Taken Diabetes Medication).***

- ***Measures: Average Time in Hospital = AVG(Time in Hospital).***

In terms of average time spent in the hospital, patients that have taken diabetes medication spent an average of 4.4 days in the hospital, while patients who have not taken diabetes medication spend 4.0 days. This data shows that patients who take medication spend slightly more time in the hospital than patients that have not. As a result, the data can suggest that patients taking diabetes medication may spend more time in the hospital to monitor how effective the medication is for the patient.

Conclusion

In conclusion, the Excel and Tableau analyses provided valuable insights into trends and factors influencing the length of stay among diabetic patients. Through the analysis of demographic characteristics and diabetic medication, we were able to identify insights that influence the length of hospital stays. The analyses revealed that older and specific racial groups tend to undergo longer hospital stays, while admission types and medication usage also identify as significant influencing factors. These findings emphasize the need for tailored healthcare services and optimized resources. The insights from this analysis prepare healthcare providers with the information necessary to develop effective patient-focused strategies for managing diabetes.