```
import pandas as pd

# Load dataset
df = pd.read_csv("healthcare_dataset.csv")

# Show first 5 rows
df.head()
```

	Name	Age	Gender	Blood Type	Medical Condition	Date of Admission	Doctor	Hospital	Insurance Provider	Billing Amount	Room Number	Admission Type	Discharge Date	Medicat
0	Bobby JacksOn	30	Male	B-	Cancer	2024-01-31	Matthew Smith	Sons and Miller	Blue Cross	18856.281306	328	Urgent	2024-02-02	Paracet
1	LesLie TErRy	62	Male	A+	Obesity	2019-08-20	Samantha Davies	Kim Inc	Medicare	33643.327287	265	Emergency	2019-08-26	Ibupr
2	DaNnY sMitH	76	Female	A-	Obesity	2022-09-22	Tiffany Mitchell	Cook PLC	Aetna	27955.096079	205	Emergency	2022-10-07	As
3	andrEw waTtS	28	Female	O+	Diabetes	2020-11-18	Kevin Wells	Hernandez Rogers and Vang,	Medicare	37909.782410	450	Elective	2020-12-18	Ibupr

```
# Convert datetime columns
df["Date of Admission"] = pd.to_datetime(df["Date of Admission"], errors="coerce")
df["Discharge Date"] = pd.to_datetime(df["Discharge Date"], errors="coerce")

# Forward fill without sorting
df = df.ffill()
df = df.reset_index(drop=True)
print(df.head())   # will now match the Serial No order
```

```
            Name  Age  Gender Blood Type Medical Condition Date of Admission  \
0  Bobby JacksOn   30    Male         B-            Cancer        2024-01-31
1   LesLie TErRy   62    Male         A+           Obesity        2019-08-20
2    DaNnY sMitH   76  Female         A-           Obesity        2022-09-22
3   andrEw waTtS   28  Female         O+          Diabetes        2020-11-18
4  adrIENNE bEll   43  Female        AB+            Cancer        2022-09-19

             Doctor                    Hospital Insurance Provider  \
0     Matthew Smith              Sons and Miller         Blue Cross
1   Samantha Davies                      Kim Inc           Medicare
2  Tiffany Mitchell                     Cook PLC              Aetna
3       Kevin Wells  Hernandez Rogers and Vang,           Medicare
4    Kathleen Hanna                 White-White              Aetna

   Billing Amount  Room Number Admission Type Discharge Date   Medication  \
0   18856.281306          328         Urgent     2024-02-02  Paracetamol
1   33643.327287          265      Emergency     2019-08-26    Ibuprofen
2   27955.096079          205      Emergency     2022-10-07      Aspirin
3   37909.782410          450       Elective     2020-12-18    Ibuprofen
4   14238.317814          458         Urgent     2022-10-09   Penicillin

   Test Results
0        Normal
1  Inconclusive
2        Normal
3      Abnormal
4      Abnormal
```

```
# 1. Create Length of Stay (in days)
df["Length_of_Stay"] = (df["Discharge Date"] - df["Date of Admission"]).dt.days

# 2. Create High Billing feature
median_billing = df["Billing Amount"].median()
df["High_Billing"] = (df["Billing Amount"] > median_billing).astype(int)

# Check results
print(df[["Date of Admission", "Discharge Date", "Length_of_Stay", "Billing Amount", "High_Billing"]].head(10))
```

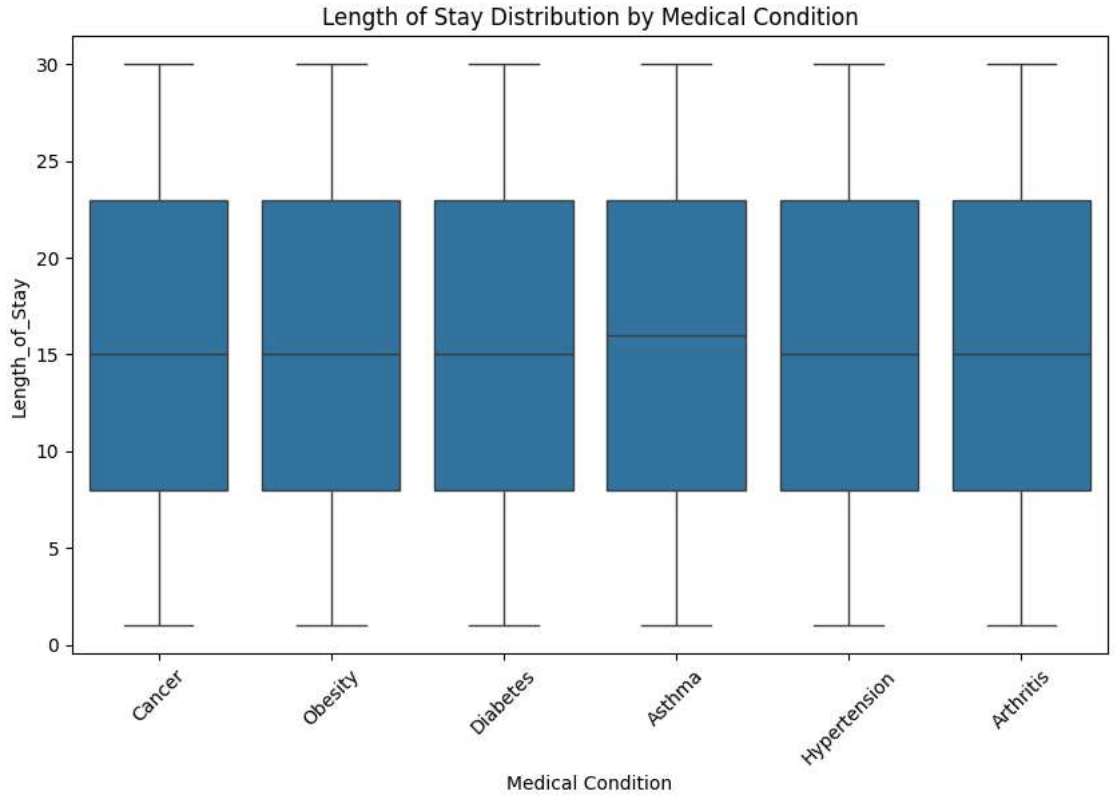
```
  Date of Admission Discharge Date  Length_of_Stay  Billing Amount  \
0        2024-01-31     2024-02-02               2    18856.281306
1        2019-08-20     2019-08-26               6    33643.327287
2        2022-09-22     2022-10-07              15    27955.096079
3        2020-11-18     2020-12-18              30    37909.782410
4        2022-09-19     2022-10-09              20    14238.317814
5        2023-12-20     2023-12-24               4    48145.110951
6        2020-11-03     2020-11-15              12    19580.872345
```

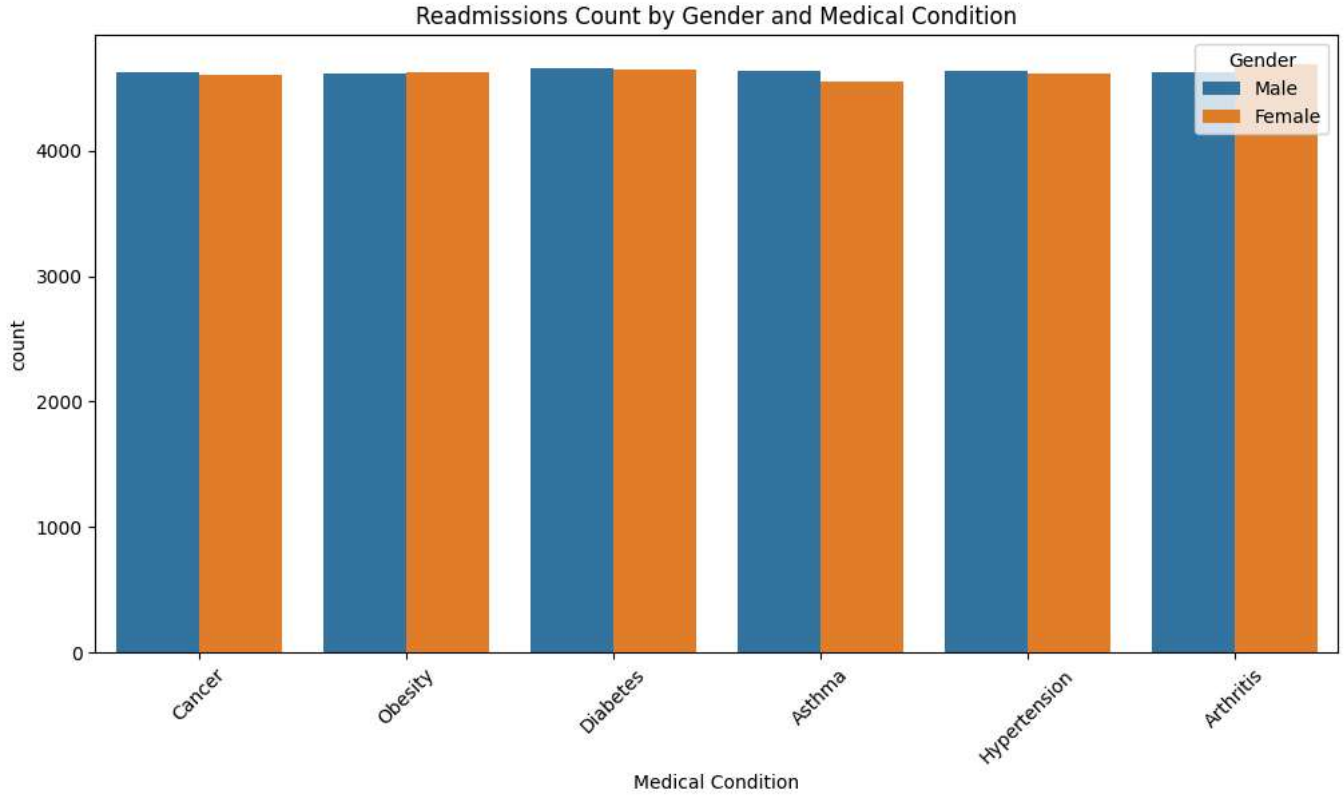
```
7        2021-12-28     2022-01-07             10    45820.462722
8        2020-07-01     2020-07-14             13    50119.222792
9        2021-05-23     2021-06-22             30    19784.631062

   High_Billing
0             0
1             1
2             1
3             1
4             0
5             1
6             0
7             1
8             1
9             0
```

```
import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(10,6))
sns.boxplot(x="Medical Condition", y="Length_of_Stay", data=df)
plt.xticks(rotation=45)   # Rotate labels for readability
plt.title("Length of Stay Distribution by Medical Condition")
plt.show()
plt.figure(figsize=(12,6))
sns.countplot(x="Medical Condition", hue="Gender", data=df)
plt.xticks(rotation=45)
plt.title("Readmissions Count by Gender and Medical Condition")
plt.show()
```






```
# Create a simulated Readmission column (1 = readmitted, 0 = not)
df['Readmission Risk'] = ((df['Length_of_Stay'] > 7) | (df['Billing Amount'] > df['Billing Amount'].median())).astype(int)


# ML imports
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, classification_report

# Encode categorical variables (Gender, Medical Condition)
```

```
le_gender = LabelEncoder()
df['Gender'] = le_gender.fit_transform(df['Gender'])  # Male=1, Female=0 (for example)

le_condition = LabelEncoder()
df['Medical Condition'] = le_condition.fit_transform(df['Medical Condition'])

# Select features (X) and target (y)
X = df[['Age', 'Gender', 'Medical Condition', 'Billing Amount', 'Length_of_Stay']]
y = df['Readmission Risk']   # assuming 1 = yes, 0 = no

# Split dataset into train (80%) and test (20%)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42, stratify=y)

# Train Logistic Regression model
model = LogisticRegression(max_iter=1000)
model.fit(X_train, y_train)

# Predictions
y_pred = model.predict(X_test)

# Evaluation metrics
accuracy = accuracy_score(y_test, y_pred)
precision = precision_score(y_test, y_pred)
recall = recall_score(y_test, y_pred)
f1 = f1_score(y_test, y_pred)

print("Model Evaluation:")
print(f"Accuracy : {accuracy:.4f}")
print(f"Precision: {precision:.4f}")
print(f"Recall   : {recall:.4f}")
print(f"F1-score : {f1:.4f}")
print("\nDetailed Report:\n", classification_report(y_test, y_pred))
```

```
Model Evaluation:
Accuracy : 0.9619
Precision: 0.9761
Recall   : 0.9810
F1-score : 0.9785

Detailed Report:
                precision    recall  f1-score   support

           0       0.85      0.82      0.83      1281
           1       0.98      0.98      0.98      9819

    accuracy                           0.96     11100
   macro avg       0.91      0.90      0.91     11100
weighted avg       0.96      0.96      0.96     11100
```