TEAM ID : PNT2022TMID20910

Exploratory Data Analysis:

Required libraries:

In [1]:
```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

%matplotlib inline
```

In [2]:
```
df= pd.read_csv("C:/Users/nprav/OneDrive/Desktop/Healthcare_Data/train_data.csv")
```

In [3]:
```
df
```

Out[3]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Bed Grade	patientid	City_Code_Patient	Type of Admission	Severity of Illness	Visitors with Patient	Age	A
0	1	8	c	3	Z	3	radiotherapy	R	F	2.0	31397	7.0	Emergency	Extreme	2	51-60	
1	2	2	c	5	Z	2	radiotherapy	S	F	2.0	31397	7.0	Trauma	Extreme	2	51-60	
2	3	10	e	1	X	2	anesthesia	S	E	2.0	31397	7.0	Trauma	Extreme	2	51-60	
3	4	26	b	2	Y	2	radiotherapy	R	D	2.0	31397	7.0	Trauma	Extreme	2	51-60	
4	5	26	b	2	Y	2	radiotherapy	S	D	2.0	31397	7.0	Trauma	Extreme	2	51-60	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
318433	318434	6	a	6	X	3	radiotherapy	Q	F	4.0	86499	23.0	Emergency	Moderate	3	41-50	
318434	318435	24	a	1	X	2	anesthesia	Q	E	4.0	325	8.0	Urgent	Moderate	4	81-90	
318435	318436	7	a	4	X	3	gynecology	R	F	4.0	125235	10.0	Emergency	Minor	3	71-80	
318436	318437	11	b	2	Y	3	anesthesia	Q	D	3.0	91081	8.0	Trauma	Minor	5	11-20	
318437	318438	19	a	7	Y	5	gynecology	Q	C	2.0	21641	8.0	Emergency	Minor	2	11-20	

318438 rows × 18 columns

In [4]:
```
df.head()
```

Out[4]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Bed Grade	patientid	City_Code_Patient	Type of Admission	Severity of Illness	Visitors with Patient	Age	Admissi
0	1	8	c	3	Z	3	radiotherapy	R	F	2.0	31397	7.0	Emergency	Extreme	2	51-60	
1	2	2	c	5	Z	2	radiotherapy	S	F	2.0	31397	7.0	Trauma	Extreme	2	51-60	
2	3	10	e	1	X	2	anesthesia	S	E	2.0	31397	7.0	Trauma	Extreme	2	51-60	
3	4	26	b	2	Y	2	radiotherapy	R	D	2.0	31397	7.0	Trauma	Extreme	2	51-60	
4	5	26	b	2	Y	2	radiotherapy	S	D	2.0	31397	7.0	Trauma	Extreme	2	51-60	

In [5]:
```
df.tail()
```

Out[5]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Bed Grade	patientid	City_Code_Patient	Type of Admission	Severity of Illness	Visitors with Patient	Age	A
318433	318434	6	a	6	X	3	radiotherapy	Q	F	4.0	86499	23.0	Emergency	Moderate	3	41-50	
318434	318435	24	a	1	X	2	anesthesia	Q	E	4.0	325	8.0	Urgent	Moderate	4	81-90	
318435	318436	7	a	4	X	3	gynecology	R	F	4.0	125235	10.0	Emergency	Minor	3	71-80	
318436	318437	11	b	2	Y	3	anesthesia	Q	D	3.0	91081	8.0	Trauma	Minor	5	11-20	
318437	318438	19	a	7	Y	5	gynecology	Q	C	2.0	21641	8.0	Emergency	Minor	2	11-20	

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 318438 entries, 0 to 318437
Data columns (total 18 columns):
 #   Column                             Non-Null Count   Dtype  
---  ------                             --------------   -----  
 0   case_id                            318438 non-null  int64  
 1   Hospital_code                      318438 non-null  int64  
 2   Hospital_type_code                 318438 non-null  object 
 3   City_Code_Hospital                 318438 non-null  int64  
 4   Hospital_region_code               318438 non-null  object 
 5   Available Extra Rooms in Hospital  318438 non-null  int64  
 6   Department                         318438 non-null  object 
 7   Ward_Type                          318438 non-null  object 
 8   Ward_Facility_Code                 318438 non-null  object 
 9   Bed Grade                          318325 non-null  float64
 10  patientid                          318438 non-null  int64  
 11  City_Code_Patient                  313906 non-null  float64
 12  Type of Admission                  318438 non-null  object 
 13  Severity of Illness                318438 non-null  object 
 14  Visitors with Patient              318438 non-null  int64  
 15  Age                                318438 non-null  object 
 16  Admission_Deposit                  318438 non-null  float64
 17  Stay                               318438 non-null  object 
dtypes: float64(3), int64(6), object(9)
memory usage: 43.7+ MB
```

In [7]:
```
df.dtypes
```

Out[7]:
```
case_id                                int64
Hospital_code                          int64
Hospital_type_code                    object
City_Code_Hospital                     int64
Hospital_region_code                  object
Available Extra Rooms in Hospital      int64
Department                            object
Ward_Type                             object
Ward_Facility_Code                    object
Bed Grade                            float64
patientid                              int64
City_Code_Patient                    float64
Type of Admission                     object
Severity of Illness                   object
Visitors with Patient                  int64
Age                                   object
Admission_Deposit                    float64
Stay                                  object
dtype: object
```

In [8]:
```
df.shape
```

Out[8]:
```
(318438, 18)
```

Before Null Values checking :

In [22]:
```
df.isnull().sum().sum()
```

Out[22]:
```
4645
```

In [25]:
```
df.isnull()
```

Out[25]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Bed Grade	patientid	City_Code_Patient	Type of Admission	Severity of Illness	Visitors with Patient	Age	A
0	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
1	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
2	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
3	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
4	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
318433	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
318434	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
318435	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
318436	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	
318437	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	

318438 rows × 18 columns

In [26]:
```
df.describe()
```

Out[26]:

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit
count	318438.000000	318438.000000	318438.000000	318438.000000	318325.000000	318438.000000	313906.000000	318438.000000	318438.000000
mean	159219.500000	18.318841	4.771717	3.197627	2.625807	65747.579472	7.251859	3.284099	4880.749392
std	91925.276847	8.633755	3.102535	1.168171	0.873146	37979.936440	4.745266	1.764061	1086.776254
min	1.000000	1.000000	1.000000	0.000000	1.000000	1.000000	1.000000	0.000000	1800.000000
25%	79610.250000	11.000000	2.000000	2.000000	2.000000	32847.000000	4.000000	2.000000	4186.000000
50%	159219.500000	19.000000	5.000000	3.000000	3.000000	65724.500000	8.000000	3.000000	4741.000000
75%	238828.750000	26.000000	7.000000	4.000000	3.000000	98470.000000	8.000000	4.000000	5409.000000
max	318438.000000	32.000000	13.000000	24.000000	4.000000	131624.000000	38.000000	32.000000	11008.000000

In [27]:
```
df.isnull().sum()
```

Out[27]:
```
case_id                                 0
Hospital_code                           0
Hospital_type_code                      0
City_Code_Hospital                      0
Hospital_region_code                    0
Available Extra Rooms in Hospital       0
Department                              0
Ward_Type                               0
Ward_Facility_Code                      0
Bed Grade                             113
patientid                               0
City_Code_Patient                    4532
Type of Admission                       0
Severity of Illness                     0
Visitors with Patient                   0
Age                                     0
Admission_Deposit                       0
Stay                                    0
dtype: int64
```

In [11]:
```
df.corr()
```

Out[11]:

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit
case_id	1.000000	-0.043023	-0.011352	0.042580	0.013702	-0.004150	0.065196	0.001309	-0.045972
Hospital_code	-0.043023	1.000000	0.128294	-0.059638	-0.013739	0.002291	-0.015530	-0.028500	0.045446
City_Code_Hospital	-0.011352	0.128294	1.000000	-0.045771	-0.049309	0.000750	-0.023988	0.018184	-0.034455
Available Extra Rooms in Hospital	0.042580	-0.059638	-0.045771	1.000000	-0.115868	0.000921	-0.009681	0.096714	-0.143739
Bed Grade	0.013702	-0.013739	-0.049309	-0.115868	1.000000	0.001645	-0.008105	0.088945	0.073833
patientid	-0.004150	0.002291	0.000750	0.000921	0.001645	1.000000	0.002002	0.006889	-0.000877
City_Code_Patient	0.065196	-0.015530	-0.023988	-0.009681	-0.008105	0.002002	1.000000	-0.012074	0.025837
Visitors with Patient	0.001309	-0.028500	0.018184	0.096714	0.088945	0.006889	-0.012074	1.000000	-0.150358
Admission_Deposit	-0.045972	0.045446	-0.034455	-0.143739	0.073833	-0.000877	0.025837	-0.150358	1.000000

In [28]:
```
df.isnull().sum().sum()
```

Out[28]:
```
4645
```

Work With Null Values :

In [32]:
```
df['Bed Grade'].fillna(df['Bed Grade'].mean(),inplace=True)
```

In [33]:
```
df['Bed Grade'].isnull().sum()
```

Out[33]:
```
0
```

In [34]:
```
df.isnull().sum()
```

Out[34]:
```
case_id                                 0
Hospital_code                           0
Hospital_type_code                      0
City_Code_Hospital                      0
Hospital_region_code                    0
Available Extra Rooms in Hospital       0
Department                              0
Ward_Type                               0
Ward_Facility_Code                      0
Bed Grade                               0
patientid                               0
City_Code_Patient                    4532
Type of Admission                       0
Severity of Illness                     0
Visitors with Patient                   0
Age                                     0
Admission_Deposit                       0
Stay                                    0
dtype: int64
```

In [35]:
```
df["City_Code_Patient"].fillna(df["City_Code_Patient"].mean(),inplace=True)
```

In [36]:
```
df["City_Code_Patient"].isnull().sum()
```

Out[36]:
```
0
```

After Cleaning Process :

Total Null Values Checking :

In [37]:
```
df.isnull().sum()
```

Out[37]:
```
case_id                              0
Hospital_code                        0
Hospital_type_code                   0
City_Code_Hospital                   0
Hospital_region_code                 0
Available Extra Rooms in Hospital    0
Department                           0
Ward_Type                            0
Ward_Facility_Code                   0
Bed Grade                            0
patientid                            0
City_Code_Patient                    0
Type of Admission                    0
Severity of Illness                  0
Visitors with Patient                0
Age                                  0
Admission_Deposit                    0
Stay                                 0
dtype: int64
```

Total Null Values :

In [38]:
```
df.isnull().sum().sum()
```

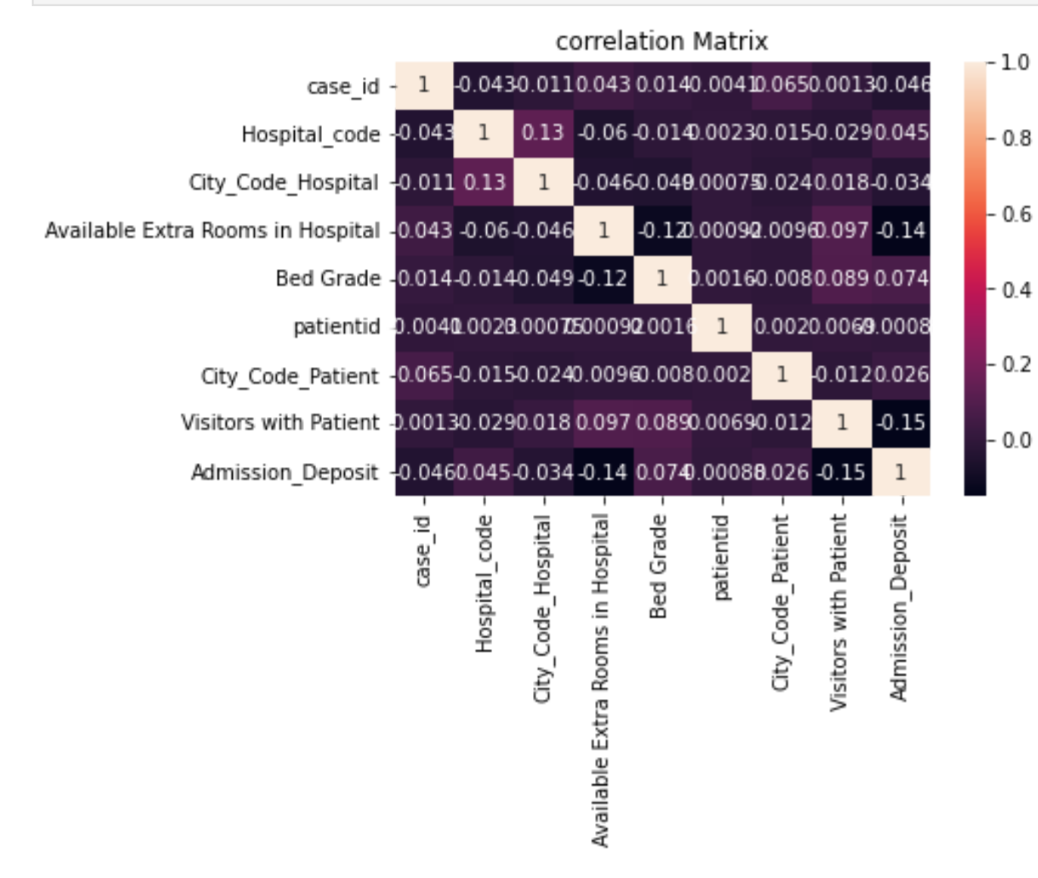
Out[38]:
```
0
```

In [39]:
```
df.cov()
```

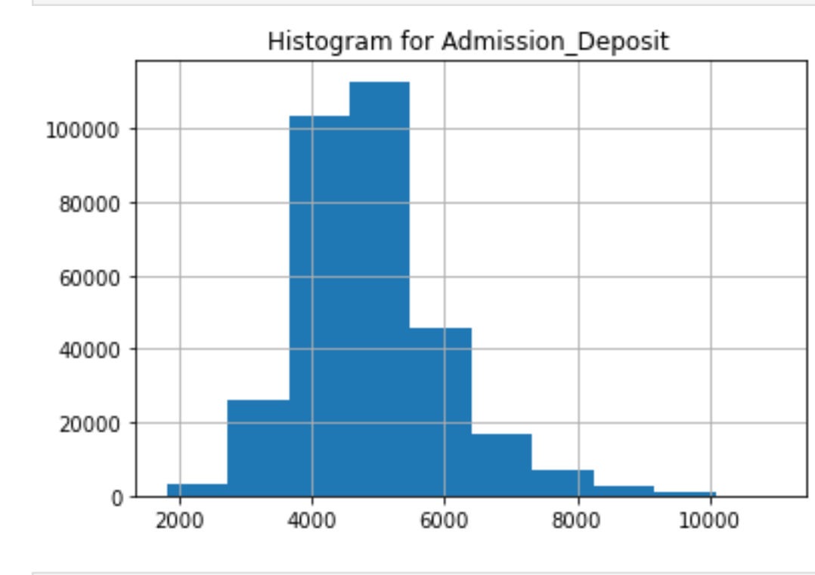
Out[39]:

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit
case_id	8.450257e+09	-34145.255936	-3237.513037	4572.484177	1099.464209	-1.448858e+07	28036.639476	212.260614	-4.592730e+06
Hospital_code	-3.414526e+04	74.541723	3.436541	-0.601495	-0.103516	7.511144e+02	-0.627298	-0.434073	4.264135e+02
City_Code_Hospital	-3.237513e+03	3.436541	9.625726	-0.165887	-0.133549	8.841958e+01	-0.348165	0.099525	-1.161750e+02
Available Extra Rooms in Hospital	4.572484e+03	-0.601495	-0.165887	1.364624	-0.118145	4.085839e+01	-0.052888	0.199302	-1.824827e+02
Bed Grade	1.099464e+03	-0.103516	-0.133549	-0.118145	0.762113	5.452883e+01	-0.033075	0.136962	7.004052e+01
patientid	-1.448858e+07	751.114364	88.419578	40.858395	54.528834	1.442476e+09	355.729931	461.576369	-3.620715e+04
City_Code_Patient	2.803664e+04	-0.627298	-0.348165	-0.052888	-0.033075	3.557299e+02	22.197075	-0.099496	1.312736e+02
Visitors with Patient	2.122606e+02	-0.434073	0.099525	0.199302	0.136962	4.615764e+02	-0.099496	3.111913	-2.882567e+02
Admission_Deposit	-4.592730e+06	426.413524	-116.175038	-182.482676	70.040518	-3.620715e+04	131.273639	-288.256679	1.181083e+06

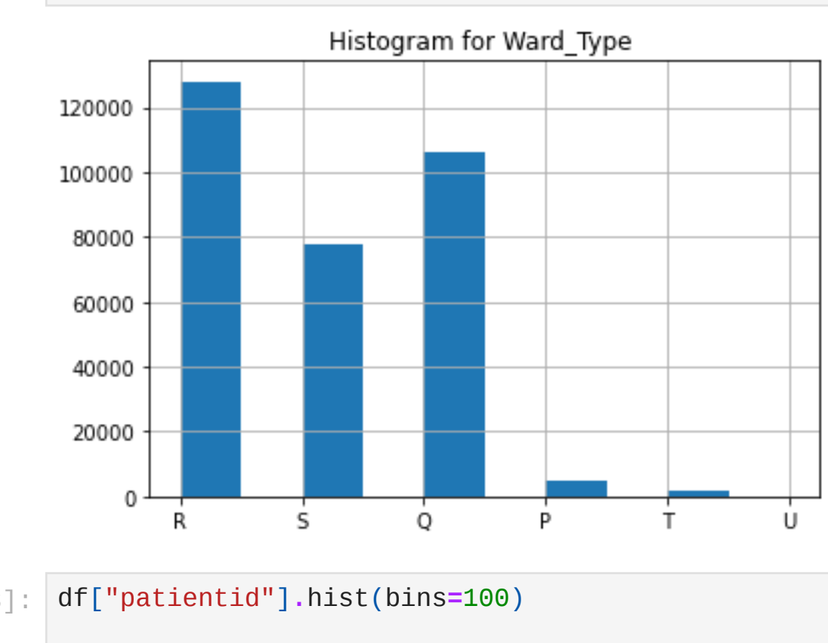
In [40]:
```
sns.heatmap(df.corr(),annot=True)

plt.title("correlation Matrix")

plt.show()
```



In [41]:
```
df["Admission_Deposit"].hist(bins=10)

plt.title("Histogram for Admission_Deposit ")

plt.show()
```



In [42]:
```
df["Ward_Type"].hist(bins=10)

plt.title("Histogram for Ward_Type ")

plt.show()
```



In [43]:
```
df["patientid"].hist(bins=100)

plt.title("Histogram for patientid ")

plt.show()
```