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ExploratoryDataAnalysis:

Requiredlibraries:

In[1]:
```
importpandasaspd
importnumpyasnp
importmatplotlib.pyplotasplt
importseabornassns
%matplotlibinline
```

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	Grade	seq patientid	City_Code_Patient	Admission	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	

318438rows×18columns

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	Grade	seq patientid	City_Code_Patient	Admission	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	Grade	seq patientid	City_Code_Patient	Admission	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	O	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 318437Data
columns(total 18columns):
 #  Column                                 Non-NullCount  Dtype
---  ------                                 --------------  -----
 0   case_id                                318438non-null int64
 1   Hospital_code                          318438non-null int64
 2   Hospital_type_code                     318438non-null object
 3   City_Code_Hospital                     318438non-null int64
 4   Hospital_region_code                   318438non-null object
 5   AvailableExtraRoomsinHospital 318438non-null int64
 6   Department                             318438non-null object
 7   Ward_Type                              318438non-null object
 8   Ward_Facility_Code                     318438non-null object
 9   BedGrade                               318325non-null float64
 10  patientid                              318438non-null int64
 11  City_Code_Patient                      313906non-null float64
 12  TypeofAdmission                        318438non-null object
 13  SeverityofIllness                      318438non-null object
 14  VisitorswithPatient                    318438non-null int64
 15  Age                                    318438non-null object
 16  Admission_Deposit                      318438non-null float64
 17  Stay                                   318438 non-nullobjectdtypes:
float64(3), int64(6), object(9)
memoryusage: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
objectAvailable Extra Rooms in Hospitalint64Department
object
Ward_Type                             object
Ward_Facility_Code                    object
BedGrade                             float64
patientid                              int64
City_Code_Patient                    float64
TypeofAdmission                       object
SeverityofIllness                     object
VisitorswithPatient                    int64
Age                                   object
Admission_Deposit                    float64
Stay                                  object
dtype:object
```

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

Out[8]: (318438,18)

BeforeNullValueschecking:

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	Grade	seq patientid	City_Code_Patient	Admission	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	False	
1	False	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	False	
3	False	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	False	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
318433	False	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	False	
318435	False	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	False	
318437	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	

318438rows×18columns

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
AvailableExtraRoomsinHospital          0
Department                             0
Ward_Type                              0
Ward_Facility_Code                     0
Bed Grade                            113
patientid                              0
City_Code_Patient                   4532
TypeofAdmission                        0
SeverityofIllness                      0
VisitorswithPatient                    0
Age                                    0
Admission_Deposit                      0
Stay                                   0
dtype:int64
```

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

Out[11]:

	0.043023		0.011352	0.042580	0.013702	-0.004150	0.065196	0.001309	-0.045972
HospitalCode	-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
AvailableExtraRoomsinHospital	0.042580	-0.059638	-0.045771	1.000000	-0.115868	0.000921	-0.009681	0.096714	-0.143739
BedGrade	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
VisitorswithPatient	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

WorkWithNullValues:

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

In[33]:
```
df['BedGrade'].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
AvailableExtraRoomsinHospital          0
Department                             0
Ward_Type                              0
Ward_Facility_Code                     0
Bed Grade                              0
patientid                              0
City_Code_Patient                   4532
TypeofAdmission                        0
SeverityofIllness                      0
VisitorswithPatient                    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 NullValues 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
AvailableExtraRoomsinHospital          0
Department                             0
Ward_Type                              0
Ward_Facility_Code                     0
Bed Grade                              0
patientid                              0
City_Code_Patient                      0
TypeofAdmission                        0
SeverityofIllness                      0
VisitorswithPatient                    0
Age                                    0
Admission_Deposit                      0
Stay                                   0
dtype:int64
```

TotalNullValues:

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

Out[38]: 0

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

Out[39]:

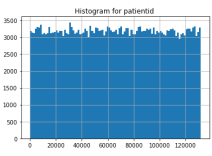
	case_id	HospitalCode	City_Code_Hospital	AvailableExtraRoomsinHospital	BedGrade	patientid	City_Code_Patient	VisitorswithPatient	Admission_Deposit
case_id	8.450257e+09	-34145.255936	-3237.513037	4572.484177	1099.464209	-1.448858e+07	28036.639476	212.260614	-4.592730e+06
Hospital_code	-3.414526e+04	74.541723	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
AvailableExtraRoomsinHospital	4.572484e+03	-0.601495	-0.165887	1.364624	-0.118145	4.085839e+01	-0.052888	0.199302	-1.824827e+02
BedGrade	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
VisitorswithPatient	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()
```


Histogram for patientid
3500
3000
2500
2000
1500
1000
500
0
0
20000
40000
60000
80000
100000
120000