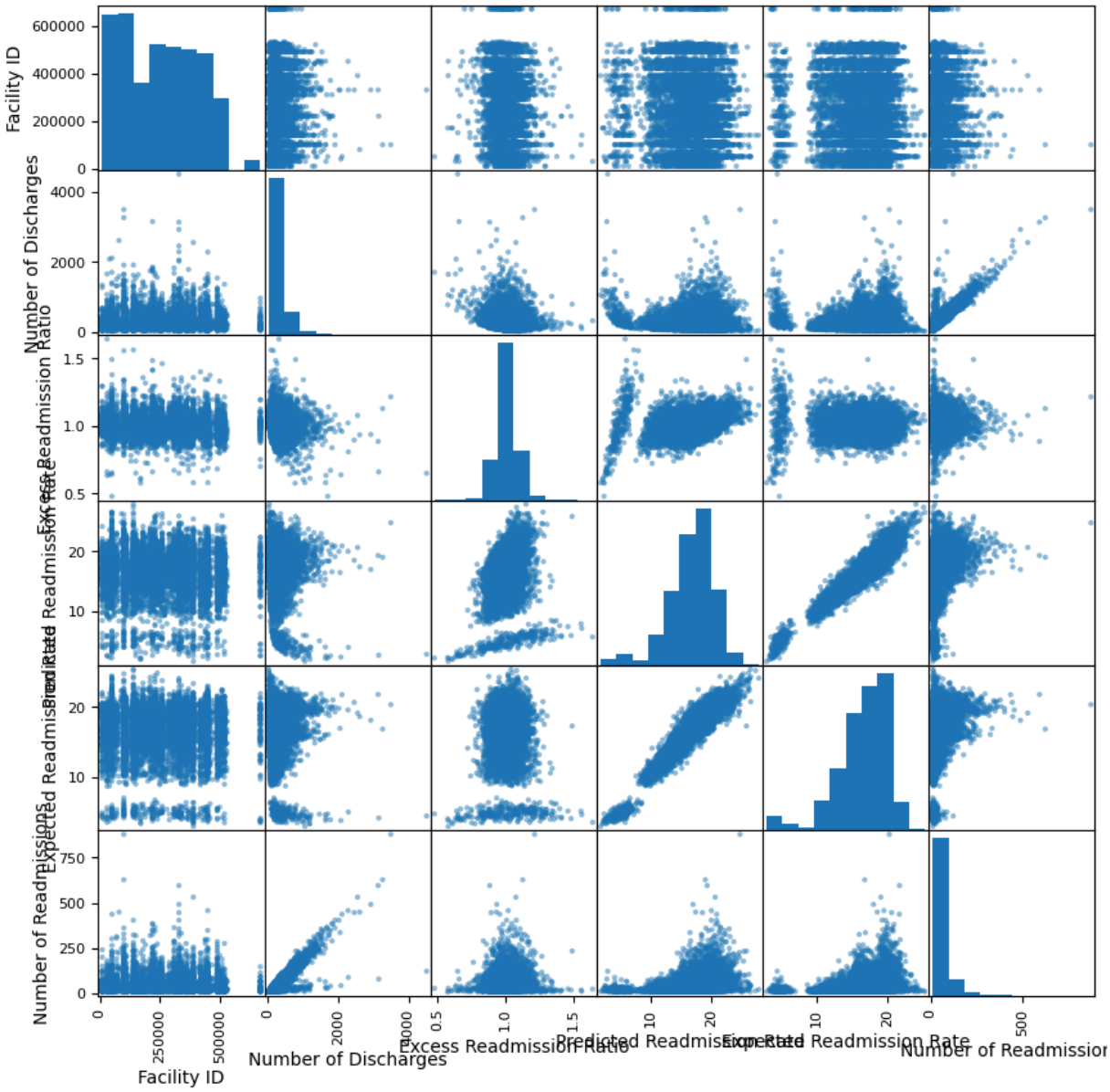
In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
data = pd.read_csv('FY_2025_Hospital_Readmissions_Reduction_Program_Hospital.csv')
print(data.columns)
print(data.head())
```

```
Index(['Facility Name', 'Facility ID', 'State', 'Measure Name',
       'Number of Discharges', 'Footnote', 'Excess Readmission Ratio',
       'Predicted Readmission Rate', 'Expected Readmission Rate',
       'Number of Readmissions', 'Start Date', 'End Date'],
      dtype='object')
                    Facility Name  Facility ID State           Measure Name  \
0  SOUTHEAST HEALTH MEDICAL CENTER        10001    AL       READM-30-AMI-HRRP
1  SOUTHEAST HEALTH MEDICAL CENTER        10001    AL      READM-30-CABG-HRRP
2  SOUTHEAST HEALTH MEDICAL CENTER        10001    AL        READM-30-HF-HRRP
3  SOUTHEAST HEALTH MEDICAL CENTER        10001    AL  READM-30-HIP-KNEE-HRRP
4  SOUTHEAST HEALTH MEDICAL CENTER        10001    AL        READM-30-PN-HRRP

   Number of Discharges  Footnote  Excess Readmission Ratio  \
0                 296.0       NaN                    0.9483
1                 151.0       NaN                    0.9509
2                 681.0       NaN                    1.0597
3                   NaN       NaN                    0.9654
4                 490.0       NaN                    0.9715

   Predicted Readmission Rate  Expected Readmission Rate  \
0                     13.0146                    13.7235
1                      9.6899                    10.1898
2                     21.5645                    20.3495
3                      4.2680                     4.4211
4                     16.1137                    16.5863

  Number of Readmissions  Start Date    End Date
0                     36  07/01/2020  06/30/2023
1                     13  07/01/2020  06/30/2023
2                    151  07/01/2020  06/30/2023
3      Too Few to Report  07/01/2020  06/30/2023
4                     77  07/01/2020  06/30/2023
```

In [3]:
```
no_foot = data.drop(columns = ['Footnote'])
#looks like some rows like Number of Discharges are not plotting because they have No
no_foot = no_foot.dropna()
no_foot['Number of Readmissions'] = no_foot['Number of Readmissions'].astype(float)
print(no_foot.head(8))
pd.plotting.scatter_matrix(no_foot.iloc[:,:], figsize = (10,10))
plt.show()
#I had to mess around with this a bunch to read those titles and then realized I coul
```

	Facility Name	Facility ID	State	Measure Name	Number of Discharges	Excess Readmission Ratio	Predicted Readmission Rate	Expected Readmission Rate	Number of Readmissions	Start Date	End Date
0	SOUTHEAST HEALTH MEDICAL CENTER	10001	AL	READM-30-AMI-HRRP	296.0	0.9483	13.0146	13.7235	36.0	07/01/2020	06/30/2023
1	SOUTHEAST HEALTH MEDICAL CENTER	10001	AL	READM-30-CABG-HRRP	151.0	0.9509	9.6899	10.1898	13.0	07/01/2020	06/30/2023
2	SOUTHEAST HEALTH MEDICAL CENTER	10001	AL	READM-30-HF-HRRP	681.0	1.0597	21.5645	20.3495	151.0	07/01/2020	06/30/2023
4	SOUTHEAST HEALTH MEDICAL CENTER	10001	AL	READM-30-PN-HRRP	490.0	0.9715	16.1137	16.5863	77.0	07/01/2020	06/30/2023
5	SOUTHEAST HEALTH MEDICAL CENTER	10001	AL	READM-30-COPD-HRRP	130.0	0.9330	15.4544	16.5637	16.0	07/01/2020	06/30/2023
8	MARSHALL MEDICAL CENTERS	10005	AL	READM-30-HF-HRRP	176.0	0.9935	20.1511	20.2835	35.0	07/01/2020	06/30/2023
9	MARSHALL MEDICAL CENTERS	10005	AL	READM-30-PN-HRRP	305.0	0.8495	13.3621	15.7296	30.0	07/01/2020	06/30/2023
11	MARSHALL MEDICAL CENTERS	10005	AL	READM-30-COPD-HRRP	144.0	0.8696	15.5737	17.9090	14.0	07/01/2020	06/30/2023



It looks like there is a very linear relationship between the predicted and expected readmission rate. In Expected and Predicted Readmission rates there appear to be two distinct groups.

Of course we would expect no correlation between the ID number and anything else.

After playing with the data more there is also a very odd linear relationship between the Number of Discharges and Readmissions, it seems there are two 'linear paths'

Variables, meanings, and datatypes: Facility Name - This is the facility where the data point took place - String

Facility ID - This relates each individual facility to an ID number - Integer

State - The state that the facility resides in - String

Measure Name - The type of measurement that occurs (medical procedure) - String

Number of Discharges - The total number of patients discharged for the measurement type - Integer

Footnote - Additional note about the data point (only about 1/3 have a footnote) - Integer

Excess Readmission Ratio - Measurement of ratio of the predicted readmission rate to the expected readmission rate - Float

Predicted Readmission Rate - Predicted 30 day readmission rate for a hospital based on its previous performances for specific cases - Float

Expected Readmission Rate - Expected 30 day readmission rate for a hospital baseed on readmission rates of similar hospitals with similar cases - Float

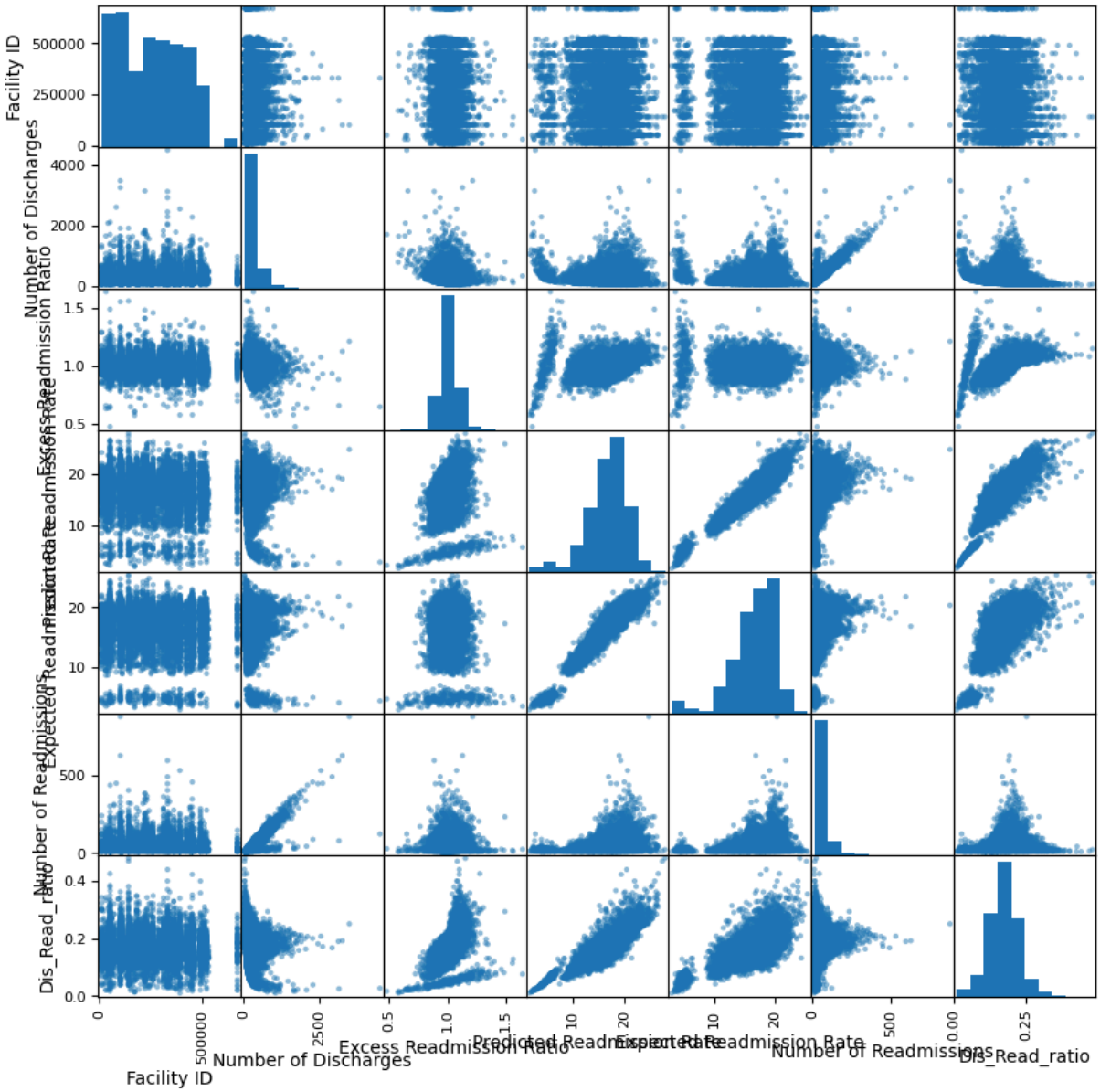
Number of Readmissions - The number of readmissions during the study period - Float

Start Date - The start date of the study - String

End Date - The end date of the study - String

[https://qualitynet.cms.gov/inpatient/hrrp/measures]

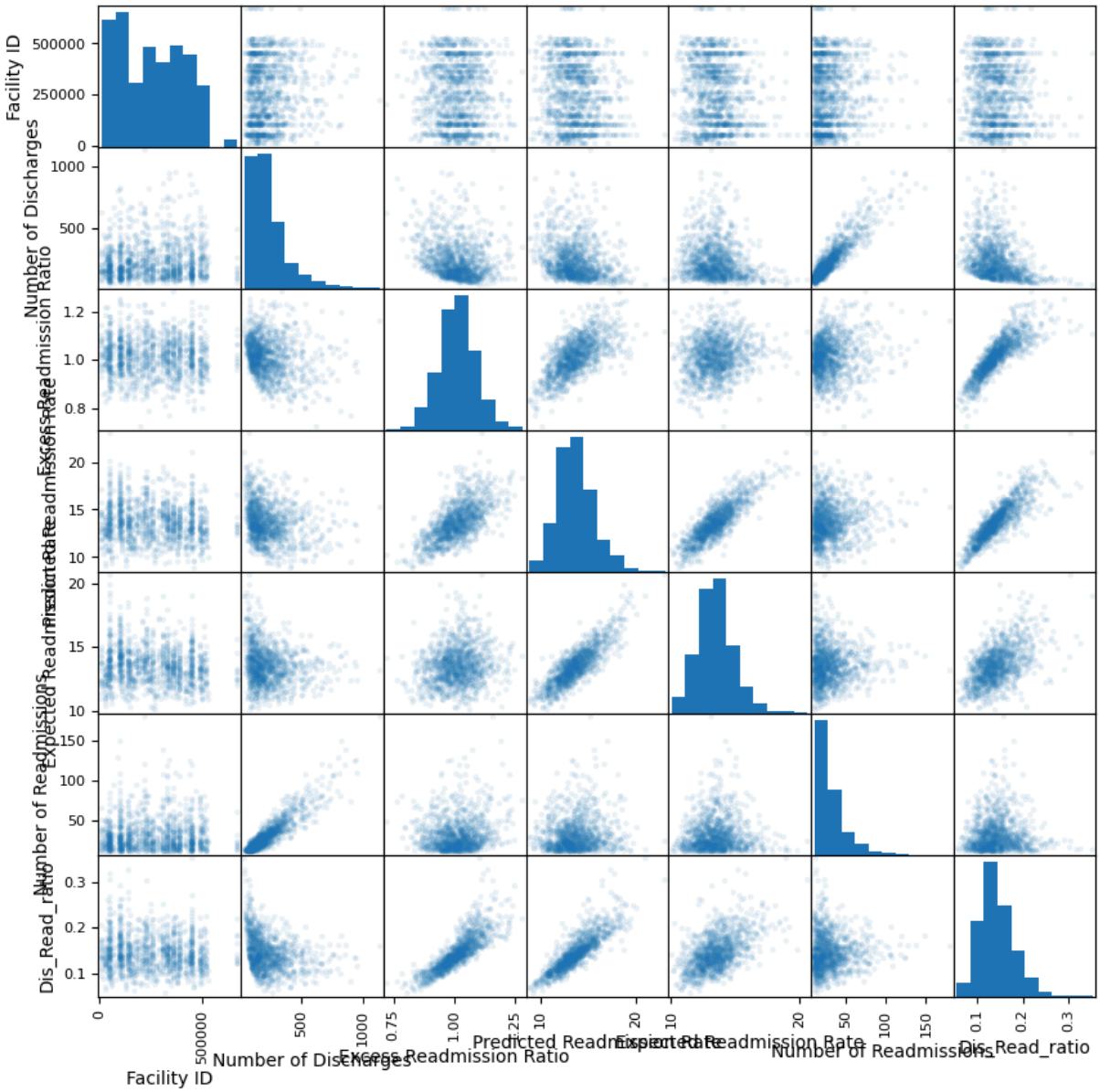
In [4]:
```
no_foot['Dis_Read_ratio'] = no_foot['Number of Readmissions']/no_foot['Number of Disc
pd.plotting.scatter_matrix(no_foot.iloc[:,:], figsize = (10,10))
plt.show()
```



In [5]:
```
print(data['Measure Name'].unique())
#There are 6 different types of measurements maybe I could evaluate the effectiveness
```

```
['READM-30-AMI-HRRP' 'READM-30-CABG-HRRP' 'READM-30-HF-HRRP'
 'READM-30-HIP-KNEE-HRRP' 'READM-30-PN-HRRP' 'READM-30-COPD-HRRP']
```

In [6]:
```
heart_attack_data = no_foot[no_foot['Measure Name'] == 'READM-30-AMI-HRRP']
pd.plotting.scatter_matrix(heart_attack_data.iloc[:,:], figsize = (10,10), alpha=0.1)
plt.show()
```



excess readmission ratio - predicted/expected predicted - based on this hospital expected based on other similar hospitals

Research Question: How is the Excess Readmission Ratio of heart attack patients (>1 means the hospital is worse thanm average {more are predicted to readmit than at other hospitals}) influenced by the Number of Discharges? What we want to know is, if hospitals discharge many patients do they have a high excess readmission rate (worse than average)? We can do this with a linear regression. If there are many patients being discharged than we might expect that this is a good hospital because they are receiving many patients.

Hypothesis: If a hospital has a high number of discharges for heart attack patients there will be a lower excess readmission ratio. (This also seems to be what the plot implies)

Why is this an interesting question for the board:

For hospitals that see a lot of patients for heart attacks, especially if they are successful in preventing readmission (repeated health issues), we would want to perform a study on why they are successful. By evaluating if it is true that hospitals that see more heart attack patients are better at treating them, then it would make sense to then look into what these hospitals are doing that is more effective than hospitals with a high excess readmission rate. This follow up allows the health industry to better analyze how treatment of these patients is effective. However, in order to perform the follow up we first need to have evidence that it is true.