INVESTIGATION OF A MEDICAL PATIENTS DATASET

The goal of this analysis is to investigate the 'noshowappointments dataset' and determine the relationship between the variables.

Importing Libraries

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

Importing the Dataset

In [2]:
```
#importing the dataset, highlighting the datetime columns and viewing the first few columns

df = pd.read_csv(r'C:\Users\Victordanok\Desktop\DAILY LEARN\Udacity\Datasets\noshowappointments-kagglev
2-may-2016.csv',
                 parse_dates=['ScheduledDay', 'AppointmentDay'])
df.head(3)
```

Out[2]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hipertension	Diabetes	Alc
0	2.987250e+13	5642903	F	2016-04-29 18:38:08+00:00	2016-04-29 00:00:00+00:00	62	JARDIM DA PENHA	0	1	0	
1	5.589978e+14	5642503	M	2016-04-29 16:08:27+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	0	0	0	
2	4.262962e+12	5642549	F	2016-04-29 16:19:04+00:00	2016-04-29 00:00:00+00:00	62	MATA DA PRAIA	0	0	0	

Exploring the dataset

In [3]:
```
#checking the information on the dataset and the datatypes

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 110527 entries, 0 to 110526
Data columns (total 14 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   PatientId       110527 non-null  float64
 1   AppointmentID   110527 non-null  int64
 2   Gender          110527 non-null  object
 3   ScheduledDay    110527 non-null  datetime64[ns, UTC]
 4   AppointmentDay  110527 non-null  datetime64[ns, UTC]
 5   Age             110527 non-null  int64
 6   Neighbourhood   110527 non-null  object
 7   Scholarship     110527 non-null  int64
 8   Hipertension    110527 non-null  int64
 9   Diabetes        110527 non-null  int64
 10  Alcoholism      110527 non-null  int64
 11  Handcap         110527 non-null  int64
 12  SMS_received    110527 non-null  int64
 13  No-show         110527 non-null  object
dtypes: datetime64[ns, UTC](2), float64(1), int64(8), object(3)
memory usage: 10.5+ MB
```

In [4]:
```
#checking for datatypes

df.dtypes.count
```

Out[4]:
```
<bound method Series.count of PatientId                      float64
AppointmentID                    int64
Gender                          object
ScheduledDay       datetime64[ns, UTC]
AppointmentDay     datetime64[ns, UTC]
Age                              int64
Neighbourhood                   object
Scholarship                      int64
Hipertension                     int64
Diabetes                         int64
Alcoholism                       int64
Handcap                          int64
SMS_received                     int64
No-show                         object
dtype: object>
```

The shape of the dataset is 110527 rows and 14 columns.

```
8 integer columns,
3 object(string) columns,
2 datetime columns,
1 float column,
```

In [5]:
```
#checking for shape of df

df.shape
```

Out[5]: `(110527, 14)`

In [6]:
```
#check for null data

df.isnull().sum()
```

Out[6]:
```
PatientId         0
AppointmentID     0
Gender            0
ScheduledDay      0
AppointmentDay    0
Age               0
Neighbourhood     0
Scholarship       0
Hipertension      0
Diabetes          0
Alcoholism        0
Handcap           0
SMS_received      0
No-show           0
dtype: int64
```

In [7]:
```
#check for duplicates

df.duplicated().sum()
```

Out[7]: `0`

Checking for Null Data

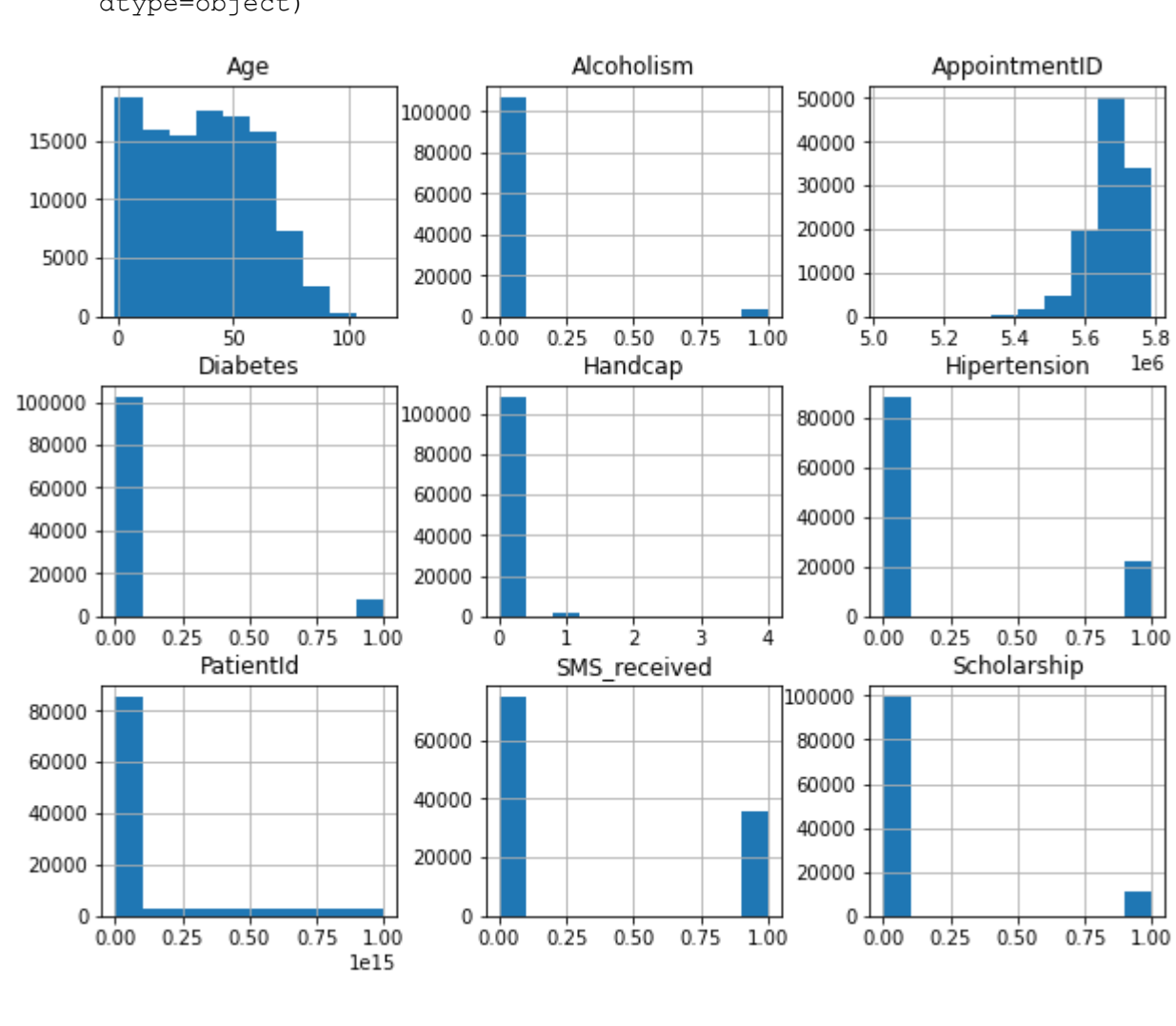
As observed above, the dataset has no null data and every column has been filled out.

I also checked for duplicated data and found none in the dataset. Having achieved this, I decided to take a closer look at the data and see if it conforms to the standard data quality dimensions

In [8]:
```
#checking the distribution of data in the columns

df.hist(figsize=(10,8))
```

Out[8]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x150D8BE0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x1420A610>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x141F3850>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x17127A00>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x17107400>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x170F4628>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x170F4DF0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x14E42820>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x14C2EBB0>]],
      dtype=object)
```



Some Observations

From the figures above, everything seems to be well distributed but the age and handicap columns have some suprising entries.

The Age column: The entry for this column seems to begin before the 0 mark and this would need to be investigated further

The handicap column: Has values other than 0 or 1 which would have meant that the patient was either handicapable or not. But seeing as entries 0, 1, 2, 3 or 4 were entered, it means the column once categorized their level of physical capabilities and now it has been converted for easy analysis

In [9]:
```
#check for unique features per column

df.nunique()
```

Out[9]:
```
PatientId          62299
AppointmentID     110527
Gender                 2
ScheduledDay      103549
AppointmentDay        27
Age                  104
Neighbourhood         81
Scholarship            2
Hipertension           2
Diabetes               2
Alcoholism             2
Handcap                5
SMS_received           2
No-show                2
dtype: int64
```

In [10]:
```
#why does handcap have 5 unique features

df.Handcap.value_counts()
```

Out[10]:
```
0    108286
1      2042
2       183
3        13
4         3
Name: Handcap, dtype: int64
```

In [11]:
```
#renaming columns

df.rename(columns = {'Handcap':'Handicap', 'Hipertension':'Hypertension'}, inplace = True)
```

In [12]:
```
#checking for inconsistencies in the data

df.query('Age == 0 & Hypertension == 1')
```

Out[12]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

In [13]:
```
#checking for inconsistencies in the data

df.query('Age == 0 & Handicap == 1')
```

Out[13]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes
98247	3.647246e+14	5788682	F	2016-06-08 13:18:12+00:00	2016-06-08 00:00:00+00:00	0	JABOUR	0	0	0

In [14]:
```
#checking for inconsistencies in the data

df.query('Age == 0 & Diabetes == 1')
```

Out[14]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

In [15]:
```
#checking for inconsistencies in the data

df.query('Age <= 0')
```

Out[15]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabete
59	7.184428e+13	5638545	F	2016-04-29 08:08:43+00:00	2016-04-29 00:00:00+00:00	0	CONQUISTA	0	0	
63	2.366233e+14	5628286	M	2016-04-27 10:46:12+00:00	2016-04-29 00:00:00+00:00	0	SÃO BENEDITO	0	0	
64	1.885174e+14	5616082	M	2016-04-25 13:28:21+00:00	2016-04-29 00:00:00+00:00	0	ILHA DAS CAIEIRAS	0	0	
65	2.718818e+14	5628321	M	2016-04-27 10:48:50+00:00	2016-04-29 00:00:00+00:00	0	CONQUISTA	0	0	
67	8.647128e+13	5639264	F	2016-04-29 08:53:02+00:00	2016-04-29 00:00:00+00:00	0	NOVA PALESTINA	0	0	
...	...	...	...	...	...	...	...	...	...	
110345	1.473952e+14	5702537	F	2016-05-16 12:30:58+00:00	2016-06-01 00:00:00+00:00	0	RESISTÊNCIA	0	0	
110346	5.577525e+12	5777724	M	2016-06-06 14:22:34+00:00	2016-06-08 00:00:00+00:00	0	RESISTÊNCIA	0	0	
110454	6.142460e+11	5772400	F	2016-06-03 15:18:44+00:00	2016-06-03 00:00:00+00:00	0	RESISTÊNCIA	0	0	
110460	4.321846e+13	5769545	F	2016-06-03 08:56:51+00:00	2016-06-03 00:00:00+00:00	0	RESISTÊNCIA	0	0	
110507	4.769462e+14	5786918	F	2016-06-08 09:04:18+00:00	2016-06-08 00:00:00+00:00	0	MARIA ORTIZ	0	0	

3540 rows × 14 columns

In [16]:
```
#checking for inconsistencies in the data

df.query('Age < 0')
```

Out[16]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes
99832	4.659432e+14	5775010	F	2016-06-06 08:58:13+00:00	2016-06-06 00:00:00+00:00	-1	ROMÃO	0	0	0

Inconsistencies in the dataset

Upon closer inspection, I noticed some patients were aged 0 and documented, but after abit exploration and confirming that they had no ailments such as Alcoholism, Diabetes or Hypertension. Those patients were included as babies who were all under the age of 1 year old.

I also noticed a female patient with age of -1 present in the dataset and I went ahead to drop this column.

In [17]:
```
#drop the column with -1 age
```

In [18]:
```
df.tail()
```

Out[18]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabete
110522	2.572134e+12	5651768	F	2016-05-03 09:15:35+00:00	2016-06-07 00:00:00+00:00	56	MARIA ORTIZ	0	0	
110523	3.596266e+12	5650093	F	2016-05-03 07:27:33+00:00	2016-06-07 00:00:00+00:00	51	MARIA ORTIZ	0	0	
110524	1.557663e+13	5630692	F	2016-04-27 16:03:52+00:00	2016-06-07 00:00:00+00:00	21	MARIA ORTIZ	0	0	
110525	9.213493e+13	5630323	F	2016-04-27 15:09:23+00:00	2016-06-07 00:00:00+00:00	38	MARIA ORTIZ	0	0	
110526	3.775115e+14	5629448	F	2016-04-27 13:30:56+00:00	2016-06-07 00:00:00+00:00	54	MARIA ORTIZ	0	0	

In [19]:
```
#checking the measures of spread and central tendency of the dataset

df.describe()
```

Out[19]:

	PatientId	AppointmentID	Age	Scholarship	Hypertension	Diabetes	Alcoholism	Handicap	SMS_rec
count	1.105270e+05	1.105270e+05	110527.000000	110527.000000	110527.000000	110527.000000	110527.000000	110527.000000	110527.0
mean	1.474963e+14	5.675305e+06	37.088874	0.098266	0.197246	0.071865	0.030400	0.022248	0.3
std	2.560949e+14	7.129575e+04	23.110205	0.297675	0.397921	0.258265	0.171686	0.161543	0.4
min	3.921784e+04	5.030230e+06	-1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0
25%	4.172614e+12	5.640286e+06	18.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0
50%	3.173184e+13	5.680573e+06	37.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0
75%	9.439172e+13	5.725524e+06	55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.0
max	9.999816e+14	5.790484e+06	115.000000	1.000000	1.000000	1.000000	1.000000	4.000000	1.0

In [20]:
```
df.head(3)
```

Out[20]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alc
0	2.987250e+13	5642903	F	2016-04-29 18:38:08+00:00	2016-04-29 00:00:00+00:00	62	JARDIM DA PENHA	0	1	0	
1	5.589978e+14	5642503	M	2016-04-29 16:08:27+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	0	0	0	
2	4.262962e+12	5642549	F	2016-04-29 16:19:04+00:00	2016-04-29 00:00:00+00:00	62	MATA DA PRAIA	0	0	0	

In [21]:
```
#creating an age group column to categorize the ages of all patients

cut_ages = [-2, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120]
df['AgeGroup'] = pd.cut(df['Age'], cut_ages)
```

In [22]:
```
df.head(3)
```

Out[22]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alc
0	2.987250e+13	5642903	F	2016-04-29 18:38:08+00:00	2016-04-29 00:00:00+00:00	62	JARDIM DA PENHA	0	1	0	
1	5.589978e+14	5642503	M	2016-04-29 16:08:27+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	0	0	0	
2	4.262962e+12	5642549	F	2016-04-29 16:19:04+00:00	2016-04-29 00:00:00+00:00	62	MATA DA PRAIA	0	0	0	

Categorizing the Age Column

A new column 'AgeGroup' was created to convert the data in the 'Age' column from continuous data into a category so it would be easier to get an insight into the ages of the patients easily. The ages were spread 10 years apart.

It should also be noted that for this analysis, the legal age for adulthood is 21 years old.

In [ ]:

In [23]:
```
#checking for null data in the new column to ensure all columns are filled

df[df.AgeGroup.isnull()]
```

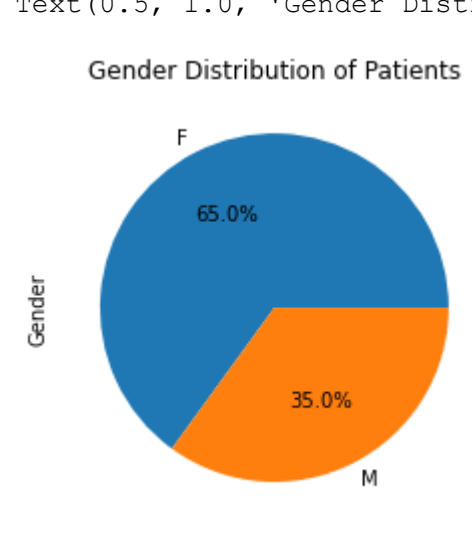
Out[23]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

In [24]:
```
#Gender distribution in the dataset

df['Gender'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Gender Distribution of Patients')
```

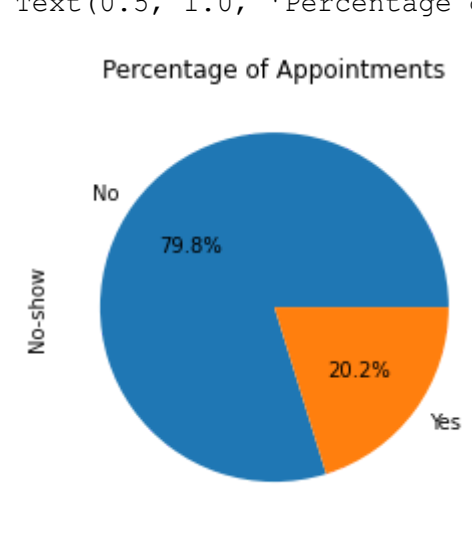
Out[24]: `Text(0.5, 1.0, 'Gender Distribution of Patients')`



In [25]:
```
#What Percentage of patients showed up for their appointment?

df['No-show'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Percentage of Appointments')
```

Out[25]: `Text(0.5, 1.0, 'Percentage of Appointments')`

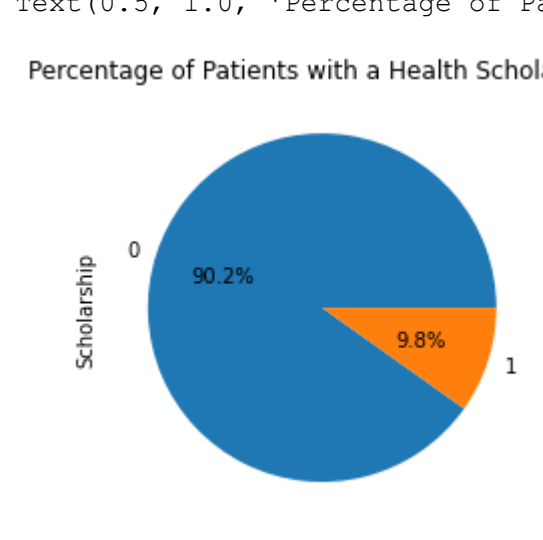


No: Represents the 79.8% that showed up for their appointment Yes: Represents the 20.2% that missed the appointment

In [26]:
```
#What percentage of patients have a Health Scholarship

df['Scholarship'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Percentage of Patients with a Health Scholarship')
```

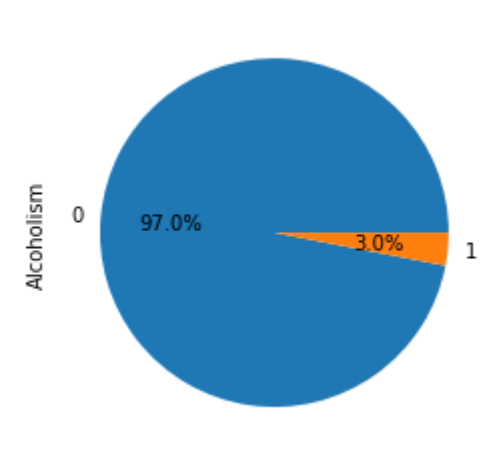
Out[26]: `Text(0.5, 1.0, 'Percentage of Patients with a Health Scholarship')`



In [27]:
```
#What Percentage of patients have alcoholism?

df['Alcoholism'].value_counts().plot.pie(autopct = '%.1f%%')
#plt.title('Percentage of Patients dealing with Alcoholism')
```

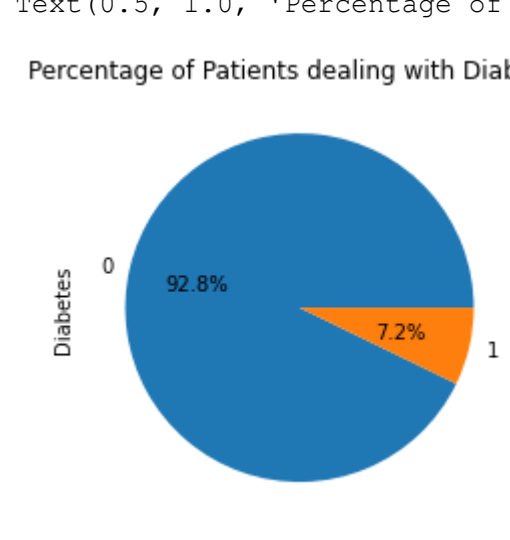
Out[27]: `<matplotlib.axes._subplots.AxesSubplot at 0x13f08100>`



In [28]:
```
#What percentage of patients have diabetes?

df['Diabetes'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Percentage of Patients dealing with Diabetes')
```

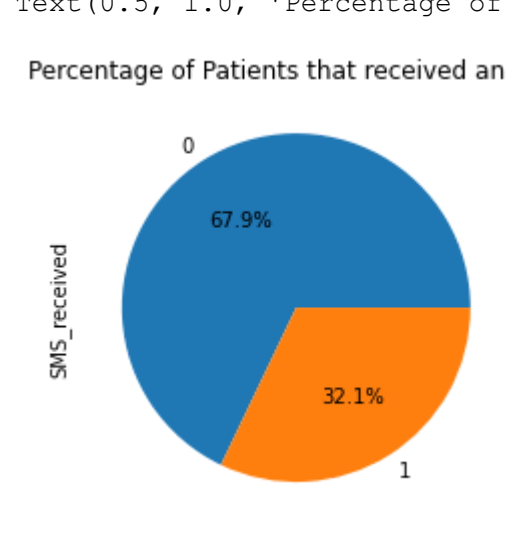
Out[28]: `Text(0.5, 1.0, 'Percentage of Patients dealing with Diabetes')`



In [29]:
```
#what percentage of patients received an SMS reminder about their appointment?

df['SMS_received'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Percentage of Patients that received an SMS')
```

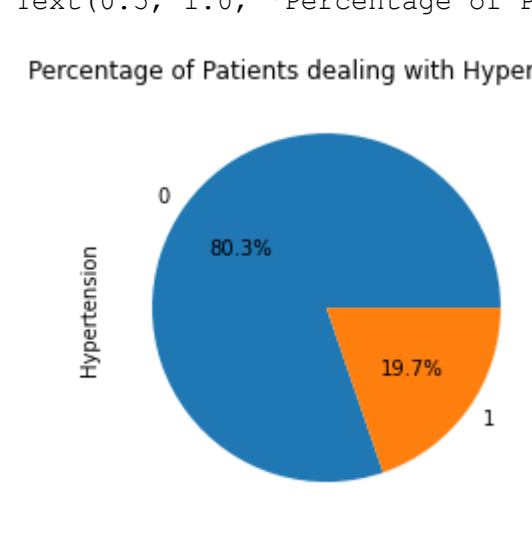
Out[29]: `Text(0.5, 1.0, 'Percentage of Patients that received an SMS')`



In [30]:
```
#how many of the patients are hypertensive?

df['Hypertension'].value_counts().plot.pie(autopct = '%.1f%%')
plt.title('Percentage of Patients dealing with Hypertension')
```

Out[30]: `Text(0.5, 1.0, 'Percentage of Patients dealing with Hypertension')`

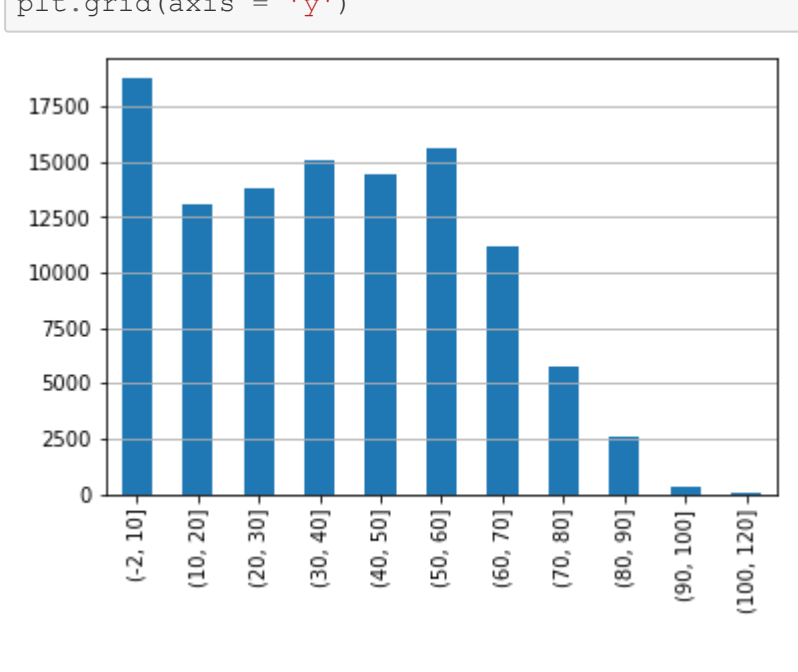


From the above information:

```
19.7% are dealing with Hypertension
3% of patients are dealing with Alcoholism
7.2% of patients are dealing with Diabetes
9.8% of patients have a health scholarship
65% of patients are females
35% of patients are males
79.8% of patients showed up for their scheduled appointments
20.2% of patients didnt show up for their appointments
```

In [31]:
```
#Age Group Distribution of Patients in the dataset

df.AgeGroup.value_counts().sort_index().plot.bar()
plt.grid(axis = 'y')
```



Does the dataset have Patients who have the four ailments?

In [32]:
```
#df1 is a dataset containing patients with 4 ailments

df1 = df.loc[(df['Alcoholism'] == 1) & (df['Handicap'] >= 1)
        & (df['Diabetes'] == 1) & (df['Hypertension'] == 1)]
```

In [33]:
```
df1.shape
```

Out[33]: `(13, 15)`

In [34]:
```
#which of these patients are on a health scholarship?

df1.loc[(df1['Scholarship']==1)]
```

Out[34]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

In [35]:
```
#which of these patients received an SMS reminding them about their appointment?

df1.loc[(df1['SMS_received']== 1)]
```

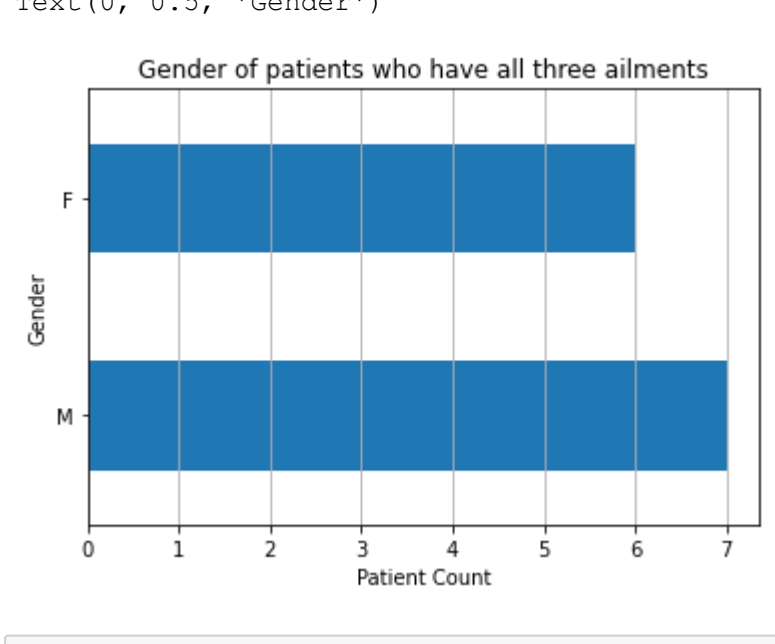
Out[35]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabete
103548	8.588652e+12	5717284	F	2016-05-19 07:47:46+00:00	2016-06-02 00:00:00+00:00	54	JESUS DE NAZARETH	0	1	
106517	8.588652e+12	5690452	F	2016-05-12 10:04:18+00:00	2016-06-01 00:00:00+00:00	54	JESUS DE NAZARETH	0	1	
106544	8.588652e+12	5758023	F	2016-06-01 10:09:39+00:00	2016-06-07 00:00:00+00:00	54	JESUS DE NAZARETH	0	1	

In [36]:
```
#Horizontal Bar chart showing Patients with All 4 ailments

df1['Gender'].value_counts().plot.barh()
plt.grid(axis = 'x')
plt.title('Gender of patients who have all three ailments')
plt.xlabel('Patient Count')
plt.ylabel('Gender')
```

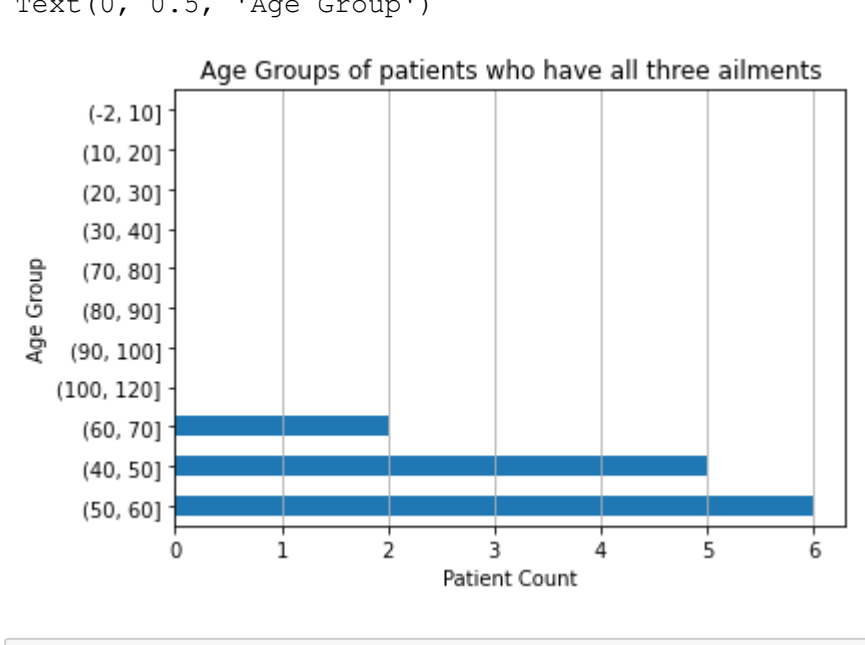
Out[36]: `Text(0, 0.5, 'Gender')`



In [37]:
```
#age group of patients with 4 ailments

df1['AgeGroup'].value_counts().plot.barh()
plt.grid(axis = 'x')
plt.title('Age Groups of patients who have all three ailments')
plt.xlabel('Patient Count')
plt.ylabel('Age Group')
```

Out[37]: `Text(0, 0.5, 'Age Group')`



In [38]:
```
#patients who missed and attended the appointment

df1['No-show'].value_counts()
```

Out[38]:
```
No     9
Yes    4
Name: No-show, dtype: int64
```

In the entirety of the dataset, Fourteen out of all the patients have alcoholism, diabetes and are also handicap and none of them are have a health scholarship. These fourteen patients are all from the ages of 40 to 70 and six of them are females while the other 8 are males

Of all 14, Nine showed up for their appointments, while the other five were a No show.

Three of these fourteen patients received an SMS about their appointments and only two out these three showed up.

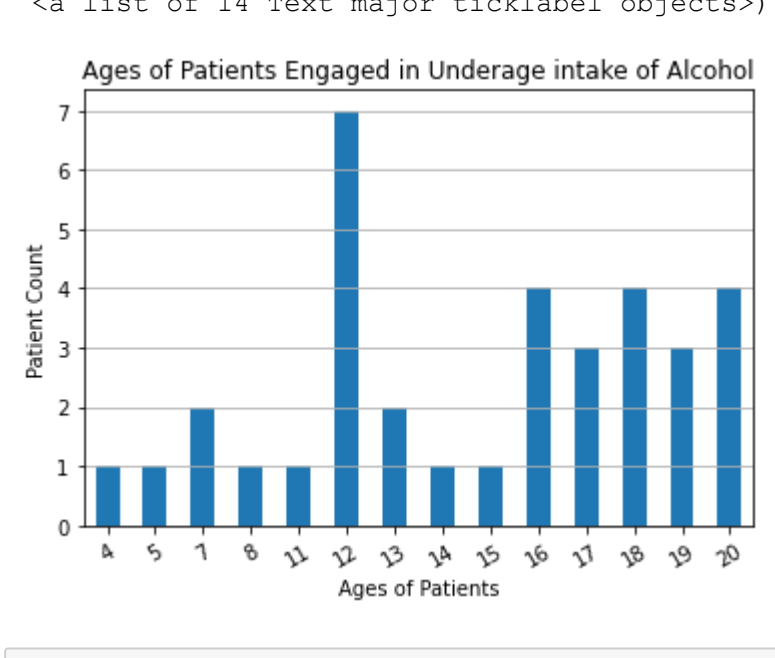
Do the Underage Patients engage in Alcoholism?

In [39]:
```
#df2 explores the rate of underage drinking in the patients

df2 = df.loc[(df['Age'] < 21) & (df['Alcoholism'] == 1)]
```

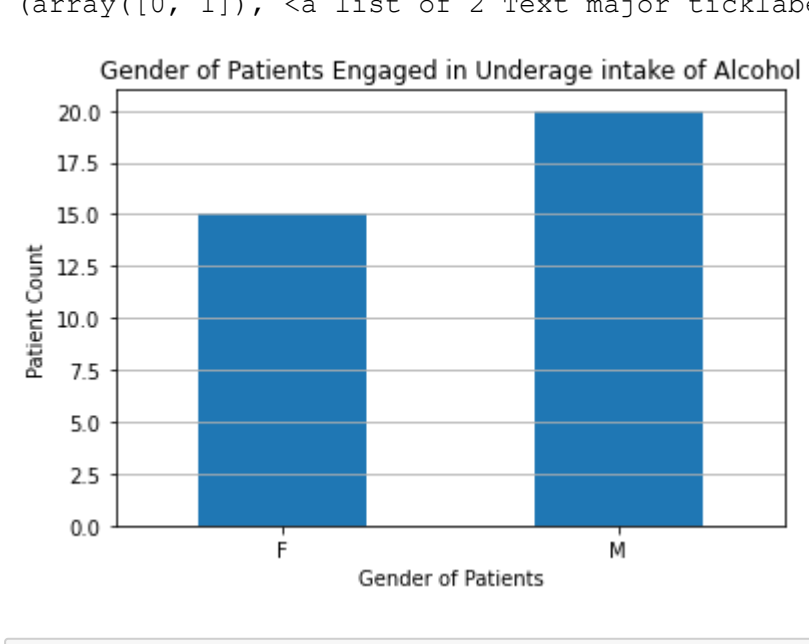
In [40]:
```
df2['Age'].value_counts().sort_index().plot.bar()
plt.grid(axis = 'y')
plt.title('Ages of Patients Engaged in Underage intake of Alcohol')
plt.xlabel('Ages of Patients')
plt.ylabel('Patient Count')
plt.xticks(rotation =  30)
```

Out[40]:
```
(array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13]),
 <a list of 14 Text major ticklabel objects>)
```



In [41]:
```
df2['Gender'].value_counts().sort_index().plot.bar()
plt.grid(axis = 'y')
plt.title('Gender of Patients Engaged in Underage intake of Alcohol')
plt.xlabel('Gender of Patients')
plt.ylabel('Patient Count')
plt.xticks(rotation =  0)
```

Out[41]: `(array([0, 1]), <a list of 2 Text major ticklabel objects>)`



In [42]:
```
#how many patients engaged in underage drinking missed their appointments?

df2.loc[(df2['No-show'].str.startswith('Y'))].shape
```

Out[42]: `(15, 15)`

In [43]:
```
#how many patients engaged in underage drinking received an sms and went for the appointment?

df2.loc[(df2['No-show'].str.startswith('N')) & (df2['SMS_received'] == 1)].shape
```

Out[43]: `(5, 15)`

In [44]:
```
#How many patients engaged in underage drinking and went for their appointment have an health scholarsh
ip?

df2.loc[(df2['No-show'].str.startswith('N')) & (df2['Scholarship'] == 1)].shape
```

Out[44]: `(4, 15)`

In [45]:
```
#how many patients engaged in underage drinking have a health scholarship?

df2.loc[(df2['Scholarship'] == 1)].shape
```

Out[45]: `(10, 15)`

In [46]:
```
#How many patients engaged in Underage drinking have either diabetes or Hypertension?

df2.loc[(df2['Hypertension'] == 0) & (df2['Diabetes'] == 1)]
```

Out[46]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

In [47]:
```
#How many patients engaged in Underage drinking have either diabetes or Hypertension?


df2.loc[(df2['Hypertension'] == 1) & (df2['Diabetes'] == 0)]
```

Out[47]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship	Hypertension	Diabetes	Alcoholis

Does Receiving an SMS prompt Patients to keep their Appointment?

In [48]:
```
#Creating the dataset

df3 = df.loc[(df['SMS_received'] == 1)]
```

In [49]:
```
#shape of the dataset

df3.shape
```

Out[49]: `(35482, 15)`

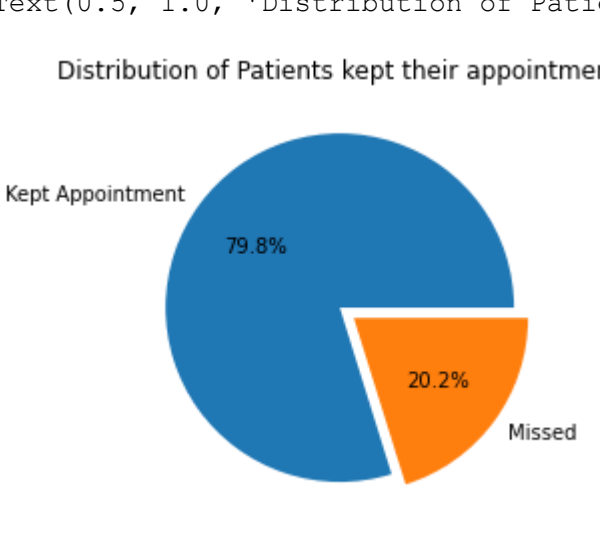
In [50]:
```
#number of patients who kept their appointment

df3.loc[(df3['No-show'].str.startswith('N'))].shape
```

Out[50]: `(25698, 15)`

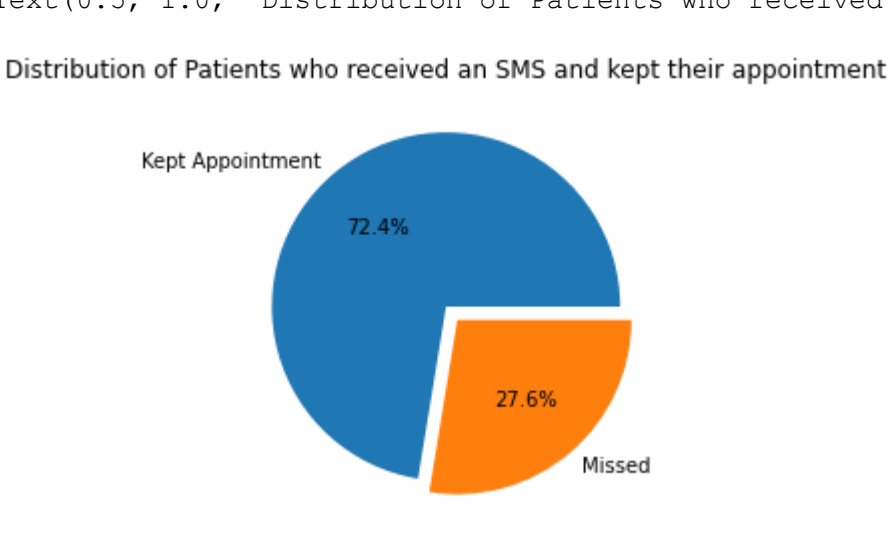
In [51]:
```
#Patients in the dataset that showed up for the Appointment

labels = ['Kept Appointment', 'Missed']
sizes = df['No-show'].value_counts()
explode = [0, 0.1]
plt.pie(x = sizes, labels = labels, autopct = '%.1f%%', explode = explode)
plt.title('Distribution of Patients kept their appointment')
```
Out[51]: `Text(0.5, 1.0, 'Distribution of Patients kept their appointment')`



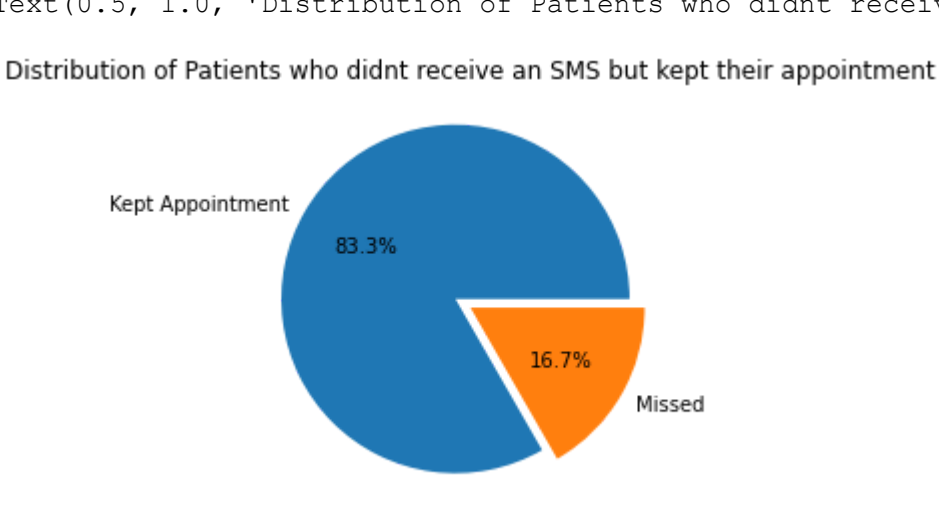
In [52]:
```
#Patients that got an SMS and showed up for the appointment

labels = ['Kept Appointment', 'Missed']
sizes = df3['No-show'].value_counts()
explode = [0, 0.1]
plt.pie(x = sizes, labels = labels, autopct = '%.1f%%', explode = explode)
plt.title('Distribution of Patients who received an SMS and kept their appointment')
```
Out[52]: `Text(0.5, 1.0, 'Distribution of Patients who received an SMS and kept their appointment')`



In [53]:
```
#distribution of patients that didnt get an SMS

labels = ['Kept Appointment', 'Missed']
sizes = df.loc[(df['SMS_received'] == 0)]['No-show'].value_counts()
explode = [0.1, 0]
plt.pie(x = sizes, labels = labels, autopct = '%.1f%%', explode = explode)
plt.title('Distribution of Patients who didnt receive an SMS but kept their appointment')
```
Out[53]: `Text(0.5, 1.0, 'Distribution of Patients who didnt receive an SMS but kept their appointment')`



In [54]:
```
#number of patients who have a scholarship

df3.query('Scholarship == 1').shape
```
Out[54]: (3505, 15)

In [55]:
```
#number of patients who have both hypertension and alcoholism and handicap

df.query('Alcoholism == 1 & Hypertension == 1 & Handicap == 1').shape
```
Out[55]: (38, 15)

In [56]:
```
#number of patients who have both alcoholism and hypertension and diabetes

df.query('Alcoholism == 1 & Hypertension == 1 & Diabetes == 1').shape
```
Out[56]: (256, 15)

In [57]:
```
df[['Age', 'Alcoholism', 'Hypertension', 'Diabetes', 'Handicap', 'Scholarship']].corr()
```
Out[57]:

	Age	Alcoholism	Hypertension	Diabetes	Handicap	Scholarship
Age	1.000000	0.095811	0.504586	0.292391	0.078033	-0.092457
Alcoholism	0.095811	1.000000	0.087971	0.018474	0.004648	0.035022
Hypertension	0.504586	0.087971	1.000000	0.433086	0.080083	-0.019729
Diabetes	0.292391	0.018474	0.433086	1.000000	0.057530	-0.024894
Handicap	0.078033	0.004648	0.080083	0.057530	1.000000	-0.008586
Scholarship	-0.092457	0.035022	-0.019729	-0.024894	-0.008586	1.000000

Conclusion

After a thorough investigation of the dataset, I posed some questions and used my analysis of the dataset to arrive at some conclusions.

```
Correlation:
There is very little correlation among the data provided in the dataset as shown from the correl
ation table.
 The strongest correlation we have is between age and hypertension which is 0.5 which suggests t
hat age plays a role in getting hypertensive.
Another correlation is between Diabetes and Hypertension of 0.4 which may suggest that a diabeti
c patient is more likely to contract Hypertension

Health Scholarship:
It is shown that the health scholarship is not popular among the patients, as less than 10% of t
he entire dataset are enrolled in it.

 Age Group of Patients:
From the age group distribution chart, we see that the data is skewed towards the younger patien
ts, this might suggest why we dont see higher cases of hypertension and diabetes amongst the dat
aset.

Patients with 4 Ailments:
We have 13 patients in this category, and all patients are from the ages of 40 to 70 which goes
 to further illustrate that the older a patient gets, the more likely his/her chances of contrac
ting Alcoholism, Hypertension or Diabetes.

Underage Intake of Alcohol:
We can see that some patients consume alcohol illegally and that the male underage patients are
 more prone to it than the female underage patients.

SMS Reminder for Appointment
The information gathered from the dataset shows that the SMS reminders do not play any significa
nt role in getting a patient to keep their appointment as more turn outs were gotten from patien
ts who didnt get any reminders
```

In [ ]: