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

In [2]:
```
from sklearn.preprocessing import LabelEncoder, OneHotEncoder, StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, confusion_matrix
import joblib
```

In [5]:
```
df=pd.read_csv("C:/Users/sridh/Desktop/WA_Fn-UseC_-Telco-Customer-Churn.csv")
df.head()
```

Out[5]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	..
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL	No	..
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL	Yes	..
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL	Yes	..
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL	Yes	..
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic	No	..

5 rows × 21 columns

In [36]:
```
print(df.columns.tolist())
```

```
['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents', 'tenure', 'PhoneService', 'MultipleLines', 'I
nternetService', 'OnlineSecurity', 'OnlineBackup', 'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingM
ovies', 'Contract', 'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn']
```

In [8]:
```
df['TotalCharges'] = pd.to_numeric(df['TotalCharges'], errors='coerce')
```

In [13]:
```
df.dropna(subset=['TotalCharges'],inplace=True)
```

In [16]:
```
print(df['TotalCharges'].isnull().sum())
print(df['TotalCharges'].dtype)
```

```
0
float64
```

In [33]:
```
df.columns = df.columns.str.strip()
df_encoded = df.copy()
```

In [34]:
```
from sklearn.preprocessing import LabelEncoder

binary_cols = ['gender', 'Partner', 'Dependents', 'PhoneService', 'PaperlessBilling', 'Churn']
le = LabelEncoder()

for col in binary_cols:
    df_encoded[col] = le.fit_transform(df_encoded[col])
```

In [35]:
```
df_encoded = pd.get_dummies(df_encoded, columns=[
    'InternetService', 'MultipleLines', 'OnlineSecurity', 'OnlineBackup',
    'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingMovies',
    'Contract', 'PaymentMethod'
], drop_first=True)
```

In [37]:
```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()


num_cols = ['tenure', 'MonthlyCharges', 'TotalCharges']
df_encoded[num_cols] = scaler.fit_transform(df_encoded[num_cols])
```

In [38]:
```
from sklearn.model_selection import train_test_split


X = df_encoded.drop(['customerID', 'Churn'], axis=1)
y = df_encoded['Churn']
```

```python
X_train, X_test, y_train, y_test = train_test_split(X, y,
                                                    test_size=0.2,
                                                    random_state=42,
                                                    stratify=y)
```

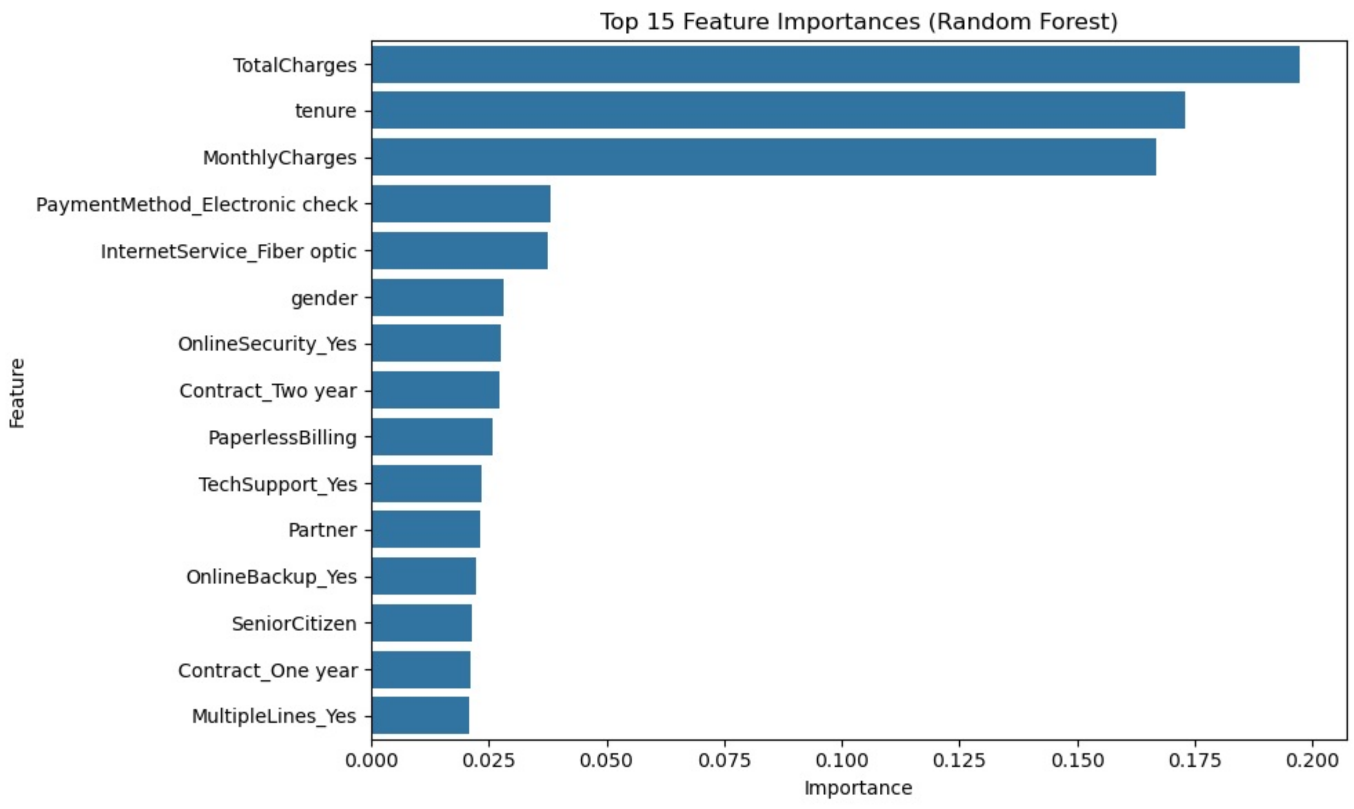
In [39]:
```python
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, confusion_matrix


lr = LogisticRegression(max_iter=1000)
lr.fit(X_train, y_train)


y_pred_lr = lr.predict(X_test)


print(" Logistic Regression Report:")
print(confusion_matrix(y_test, y_pred_lr))
print(classification_report(y_test, y_pred_lr))
```

```
 Logistic Regression Report:
[[917 116]
 [159 215]]
              precision    recall  f1-score   support

           0       0.85      0.89      0.87      1033
           1       0.65      0.57      0.61       374

    accuracy                           0.80      1407
   macro avg       0.75      0.73      0.74      1407
weighted avg       0.80      0.80      0.80      1407
```

In [40]:
```python
from sklearn.ensemble import RandomForestClassifier


rf = RandomForestClassifier(random_state=42)
rf.fit(X_train, y_train)


y_pred_rf = rf.predict(X_test)


print(" Random Forest Report:")
print(confusion_matrix(y_test, y_pred_rf))
print(classification_report(y_test, y_pred_rf))
```

```
 Random Forest Report:
[[924 109]
 [187 187]]
              precision    recall  f1-score   support

           0       0.83      0.89      0.86      1033
           1       0.63      0.50      0.56       374

    accuracy                           0.79      1407
   macro avg       0.73      0.70      0.71      1407
weighted avg       0.78      0.79      0.78      1407
```

In [41]:
```python
import matplotlib.pyplot as plt
import seaborn as sns


importances = rf.feature_importances_
features = X.columns


top_indices = importances.argsort()[-15:][::-1]
plt.figure(figsize=(10,6))
sns.barplot(x=importances[top_indices], y=features[top_indices])
plt.title("Top 15 Feature Importances (Random Forest)")
plt.xlabel("Importance")
plt.ylabel("Feature")
plt.tight_layout()
plt.show()
```



In [42]:
```python
import joblib


joblib.dump(rf, 'random_forest_churn_model.pkl')


joblib.dump(lr, 'logistic_regression_churn_model.pkl')
```

Out[42]:
```
['logistic_regression_churn_model.pkl']
```

In [43]:
```python
model = joblib.load('random_forest_churn_model.pkl')
```

In [ ]:

Loading [MathJax]/jax/output/CommonHTML/fonts/TeX/fontdata.js