

# Heart Failure Readmission Analysis

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## Introduction

Heart Failure Readmission Dataset contains information about heart failure patient records collected from various hospitals. It includes demographic records, medical history, lab test results, and hospital visit records. Readmission refers to patients who return to the hospital within a certain period after being discharged.

## Setting up Data

```
# Loading Packages
pacman:: p_load(
  gt,
  rio,      # file import
  here,     # file locator
  skimr,    # get overview of data
  tidyverse, # data management + ggplot2 graphics
  gtsummary, # summary statistics and tests
  rstatix,  # summary statistics and statistical tests
  janitor,  # adding totals and percents to tables
  scales,   # easily convert proportions to percents
  flextable # converting tables to pretty images
)

# importing dataset
heart <-
import("C:/Users/oolaa/OneDrive/Documents/GHW_HeartFailure_Readmission.csv")
```

## TABLES & CHARTS

### Creating Summary Tables and Charts

```
heart %>%
  get_summary_stats(
    Age, Length_of_Stay, Heart_Rate, Temperature, Pulse, Previous_Admissions,
    Readmission_30Days,
    type = "common") %>%
  gt() %>%
  tab_header(
    title = "Table 1: Summary Statistics of Selected Variables")
```

Table 1: Table 1: Summary Statistics of Selected Variables

variable	n	min	max	median	iqr	mean	sd	se	ci
Age	1000	45	89.0	68.0	22.0	67.000	12.946	0.409	0.803
Length_of_Stay	1000	1	14.0	7.0	7.0	7.407	4.086	0.129	0.254
Heart_Rate	1000	50	149.0	97.0	51.0	98.770	29.209	0.924	1.813
Temperature	1000	36	39.5	37.7	1.8	37.715	1.001	0.032	0.062
Pulse	1000	50	119.0	85.0	35.0	84.714	20.022	0.633	1.242
Previous_Admissions	1000	0	4.0	2.0	2.0	1.948	1.429	0.045	0.089
Readmission_30Days	1000	0	1.0	0.0	1.0	0.287	0.453	0.014	0.028

### # Creating Age Buckets

```
heart <- heart %>%
  mutate(age_group = cut(Age,
    breaks = c(44, 54, 64, 74, 84, Inf),
    labels = c("44-53", "54-63", "64-73", "74-83",
"84+"),
    right = TRUE))

table(heart$age_group)

##
## 44-53 54-63 64-73 74-83 84+
##   222   205   239   237   97
```

## Second Example

```
heart %>%
  tabyl(age_group, Gender) %>%
  adorn_totals(where = "row") %>%
  adorn_percentages(denominator = "col") %>%
  adorn_pct_formatting() %>%
  adorn_ns(position = "front") %>%
  adorn_title(
    row_name = "Age Category",
    col_name = "Gender",
    placement = "combined"
  ) %>%
  flextable() %>%
  set_caption("Table 2: Gender distribution across Age Categories") %>%
  autofit()
```

*# dataset*  
*# cross-tabulate counts*  
*# add total row*  
*# convert to proportions*  
*# convert to percents*  
*# this is to print as image*  
*# convert to pretty image*  
*# format to one line per row*

Table 2: Gender distribution across Age Categories

Age Category/Gender	Female	Male
44-53	108 (22.8%)	114 (21.7%)
54-63	102 (21.5%)	103 (19.6%)
64-73	112 (23.6%)	127 (24.1%)
74-83	104 (21.9%)	133 (25.3%)
84+	48 (10.1%)	49 (9.3%)
Total	474 (100.0%)	526 (100.0%)

### Third Example

```
heart %>%
  # Only interested columns
  select(Age, Gender, Heart_Rate, Readmission_30Days) %>%
  tbl_summary() %>%
  modify_caption("***Table 3: Another Table Example**")
```

Characteristic	N = 1,000 <sup>1</sup>
Age	68 (56, 78)
Gender	
Female	474 (47%)
Male	526 (53%)
Heart_Rate	97 (74, 125)
Readmission_30Days	287 (29%)

<sup>1</sup>Median (Q1, Q3); n (%)

```
# creating new column
heart <- heart %>%
  mutate(
    readmission = case_when(Readmission_30Days == 1 ~ "Readmitted",
                             Readmission_30Days == 0 ~ "Not Readmitted"))
```

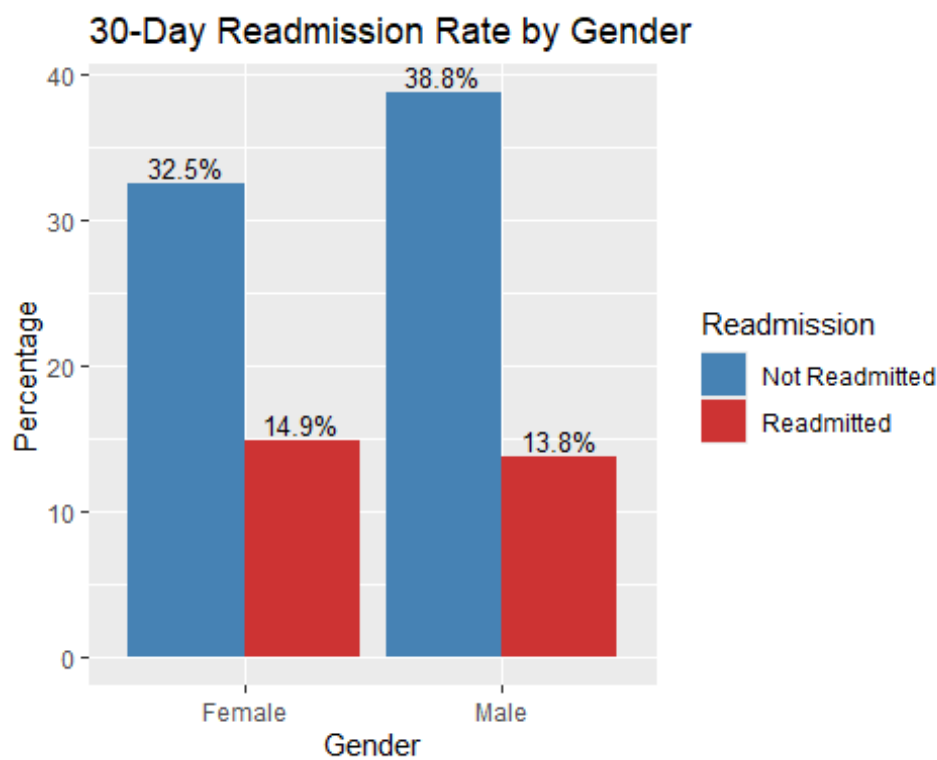
### Visualisations

```
# Creating Visualisations
```

```
# Bar Chart
```

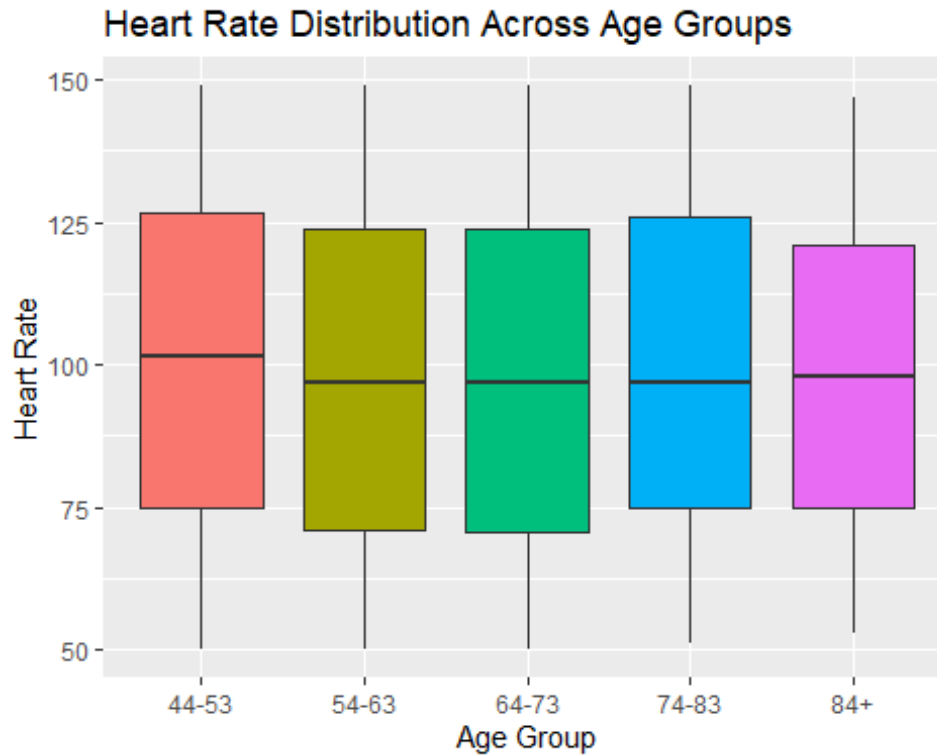
```
heart %>%
  group_by(Gender, Readmission_30Days) %>%
  summarise(count = n(), .groups = "drop") %>%
```

```
mutate(percentage = count / sum(count) * 100) %>%
ggplot(aes(x= Gender, y= percentage, fill = factor(Readmission_30Days))) +
geom_col(position = position_dodge(width = 0.9)) +
geom_text(aes(label = paste0(round(percentge, 1), "%"),
                    position = position_dodge(width= 0.9),
                    vjust = -0.3, size = 3.5) +
labs(
  title = "30-Day Readmission Rate by Gender",
  x = "Gender",
  y = "Percentage",
  fill = "Readmission") +
scale_fill_manual(values = c("0" = "steelblue", "1" = "brown3"),
                  labels = c("Not Readmitted", "Readmitted"))
```

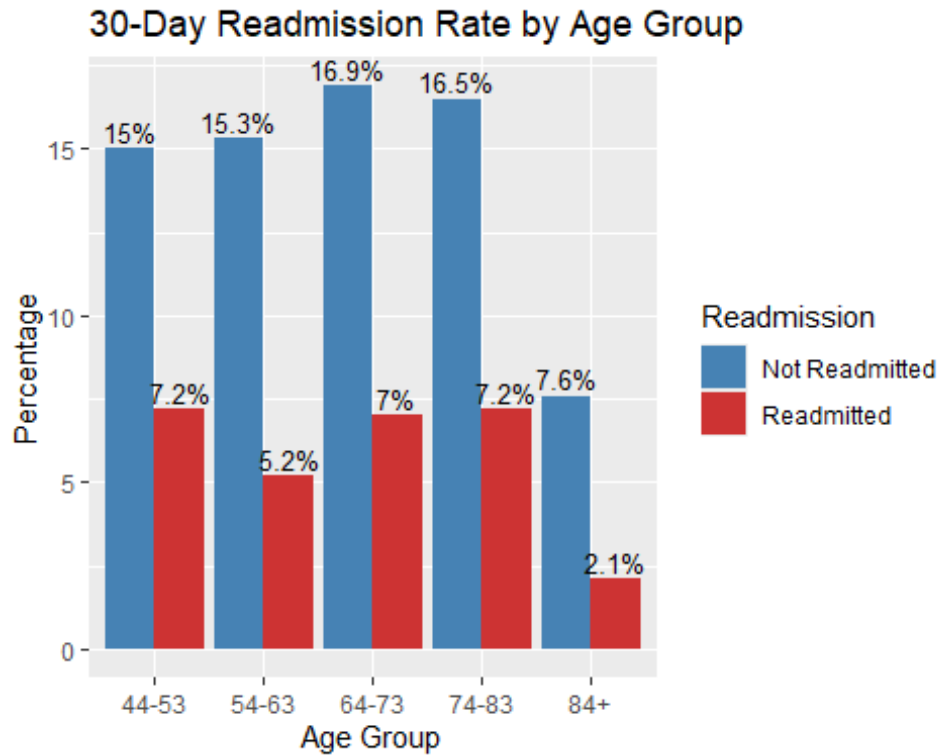


*# Boxplot*

```
ggplot(heart, aes(x= age_group, y = Heart_Rate, fill = age_group))+
geom_boxplot() +
labs(
  title = "Heart Rate Distribution Across Age Groups",
  x = "Age Group",
  y = "Heart Rate"
) +
theme(legend.position = "none")
```



```
heart %>%
  group_by(age_group, Readmission_30Days) %>%
  summarise(count = n(), .groups = "drop") %>%
  mutate(percentage = count / sum(count) * 100) %>%
  ggplot(aes(x= age_group, y= percentage, fill = factor(Readmission_30Days)))
+
  geom_col(position = position_dodge(width = 0.9)) +
  geom_text(aes(label = paste0(round(percentage, 1), "%"),
    position = position_dodge(width= 0.9),
    vjust = -0.3, size = 3.5) +
  labs(
    title = "30-Day Readmission Rate by Age Group",
    x = "Age Group",
    y = "Percentage",
    fill = "Readmission") +
  scale_fill_manual(values = c("0" = "steelblue", "1" = "brown3"),
    labels = c("Not Readmitted", "Readmitted"))
```



## Findings

1. Patients in the dataset are within 45 - 89 years old, with an average age of 67 years.
2. There are more Males (526) than Females (474).
3. Only 28.7% (287) of patients were readmitted within 30 days.
4. Females were slightly more Readmitted (14.9%) than Males (13.8%)
5. The Age bracket (44- 53) has the highest mean Heart Rate than the rest of the Age group which corresponds with higher readmission rates (7.2%).

## Conclusion

Although, Males were more captured in the data, females had a higher percentage of readmitted cases than males. Also the age brackets 44-53 and 74 - 83 had more readmitted cases. The hospital should educate patients more within this age bracket to adhere to their medications.