hip_replacement_operations

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Aim

Plot 'EQ-5D Index' scores...

Load packages

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ---------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

Read in data

The data is in the file "hip replacement"...

```
hip_data <- read_csv("Hip Replacement CCG 1819.csv")
```

```
## Rows: 28920 Columns: 81
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (5): Provider Code, Procedure, Year, Age Band, Gender
## dbl (76): Revision Flag, Pre-Op Q Assisted, Pre-Op Q Assisted By, Pre-Op Q S...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Prepare the data

```r
glimpse(hip_data)
```

```
## Rows: 28,920
## Columns: 81
## $ `Provider Code`                          <chr> "00C", "00C", "00C", ~
## $ Procedure                                <chr> "Hip Replacement", "H~
## $ `Revision Flag`                          <dbl> 0, 0, 1, 1, 0, 0, 0, ~
## $ Year                                     <chr> "2018/19", "2018/19",~
## $ `Age Band`                               <chr> "*", "*", "*", "*", "~
## $ Gender                                   <chr> "*", "*", "*", "*", "~
## $ `Pre-Op Q Assisted`                      <dbl> 2, 2, 1, 2, 2, 2, 2, ~
## $ `Pre-Op Q Assisted By`                   <dbl> 0, 0, 0, 0, 0, 0, 0, ~
## $ `Pre-Op Q Symptom Period`                <dbl> 4, 2, 4, 1, 2, 1, 1, ~
## $ `Pre-Op Q Previous Surgery`              <dbl> 2, 1, 1, 1, 2, 2, 1, ~
## $ `Pre-Op Q Living Arrangements`           <dbl> 1, 1, 2, 2, 1, 2, 1, ~
## $ `Pre-Op Q Disability`                    <dbl> 9, 1, 1, 1, 2, 1, 2, ~
## $ `Heart Disease`                          <dbl> 9, 9, 9, 9, 9, 9, 9, ~
## $ `High Bp`                                <dbl> 9, 9, 9, 9, 9, 1, 9, ~
## $ Stroke                                   <dbl> 9, 9, 9, 9, 9, 9, 1, ~
## $ Circulation                              <dbl> 9, 9, 9, 9, 1, 9, 9, ~
## $ `Lung Disease`                           <dbl> 9, 9, 9, 9, 9, 9, 9, ~
## $ Diabetes                                 <dbl> 9, 9, 9, 9, 9, 9, 9, ~
## $ `Kidney Disease`                         <dbl> 9, 9, 9, 9, 9, 1, 9, ~
## $ `Nervous System`                         <dbl> 9, 9, 9, 9, 9, 9, 9, ~
## $ `Liver Disease`                          <dbl> 9, 9, 9, 9, 9, 9, 1, ~
## $ Cancer                                   <dbl> 9, 9, 9, 9, 9, 9, 1, ~
## $ Depression                               <dbl> 9, 9, 9, 1, 9, 9, 9, ~
## $ Arthritis                                <dbl> 9, 1, 1, 1, 1, 1, 9, ~
## $ `Pre-Op Q Mobility`                      <dbl> 2, 2, 9, 2, 2, 2, 2, ~
## $ `Pre-Op Q Self-Care`                     <dbl> 1, 2, 9, 1, 2, 1, 1, ~
## $ `Pre-Op Q Activity`                      <dbl> 9, 3, 9, 3, 3, 2, 2, ~
## $ `Pre-Op Q Discomfort`                    <dbl> 9, 3, 9, 3, 3, 3, 2, ~
## $ `Pre-Op Q Anxiety`                       <dbl> 9, 1, 9, 2, 3, 1, 1, ~
## $ `Pre-Op Q EQ5D Index Profile`            <dbl> 21999, 22331, 99999, ~
## $ `Pre-Op Q EQ5D Index`                    <dbl> NA, -0.003, NA, 0.030~
## $ `Post-Op Q Assisted`                     <dbl> 2, 2, 1, 2, 2, 2, 1, ~
## $ `Post-Op Q Assisted By`                  <dbl> 9, 9, 1, 9, 9, 9, 1, ~
## $ `Post-Op Q Living Arrangements`          <dbl> 1, 1, 2, 2, 1, 2, 1, ~
## $ `Post-Op Q Disability`                   <dbl> 2, 9, 1, 2, 1, 2, 2, ~
## $ `Post-Op Q Mobility`                     <dbl> 2, 9, 2, 1, 2, 2, 1, ~
## $ `Post-Op Q Self-Care`                    <dbl> 2, 1, 2, 1, 1, 1, 1, ~
## $ `Post-Op Q Activity`                     <dbl> 2, 9, 3, 1, 2, 2, 1, ~
## $ `Post-Op Q Discomfort`                   <dbl> 2, 1, 3, 2, 2, 2, 1, ~
## $ `Post-Op Q Anxiety`                      <dbl> 2, 1, 2, 1, 2, 1, 1, ~
## $ `Post-Op Q Satisfaction`                 <dbl> 2, 3, 2, 1, 3, 1, 1, ~
## $ `Post-Op Q Sucess`                       <dbl> 1, 1, 1, 1, 2, 2, 1, ~
## $ `Post-Op Q Allergy`                      <dbl> 2, 2, 2, 2, 2, 9, 9, ~
## $ `Post-Op Q Bleeding`                     <dbl> 2, 2, 2, 2, 2, 9, 9, ~
## $ `Post-Op Q Wound`                        <dbl> 2, 2, 1, 2, 2, 9, 9, ~
## $ `Post-Op Q Urine`                        <dbl> 2, 2, 2, 2, 2, 1, 9, ~
## $ `Post-Op Q Further Surgery`              <dbl> 2, 2, 1, 2, 2, 2, 2, ~
## $ `Post-Op Q Readmitted`                   <dbl> 2, 2, 1, 2, 2, 2, 2, ~
## $ `Post-Op Q EQ5D Index Profile`           <dbl> 22222, 91911, 22332, ~
```

```
## $ `Post-Op Q EQ5D Index`                              <dbl> 0.516, NA, -0.074, 0.~
## $ `Hip Replacement EQ5D Index Post-Op Q Predicted`    <dbl> NA, NA, NA, 0.5154424~
## $ `Pre-Op Q EQ VAS`                                   <dbl> 999, 999, 999, 50, 30~
## $ `Post-Op Q EQ VAS`                                  <dbl> 70, 999, 80, 90, 70, ~
## $ `Hip Replacement EQ VAS Post-Op Q Predicted`        <dbl> NA, NA, NA, 60.05266,~
## $ `Hip Replacement Pre-Op Q Pain`                     <dbl> 1, 0, 0, 0, 0, 0, 1, ~
## $ `Hip Replacement Pre-Op Q Sudden Pain`              <dbl> 0, 1, 0, 0, 0, 1, 4, ~
## $ `Hip Replacement Pre-Op Q Night Pain`               <dbl> 2, 0, 1, 0, 0, 1, 1, ~
## $ `Hip Replacement Pre-Op Q Washing`                  <dbl> 3, 1, 1, 2, 2, 4, 4, ~
## $ `Hip Replacement Pre-Op Q Transport`                <dbl> 2, 1, 1, 0, 1, 2, 2, ~
## $ `Hip Replacement Pre-Op Q Dressing`                 <dbl> 1, 0, 1, 0, 1, 4, 2, ~
## $ `Hip Replacement Pre-Op Q Shopping`                 <dbl> 3, 2, 0, 0, 0, 0, 3, ~
## $ `Hip Replacement Pre-Op Q Walking`                  <dbl> 2, 0, 1, 1, 1, 3, 3, ~
## $ `Hip Replacement Pre-Op Q Limping`                  <dbl> 2, 0, 0, 1, 0, 0, 0, ~
## $ `Hip Replacement Pre-Op Q Stairs`                   <dbl> 2, 1, 1, 1, 1, 2, 4, ~
## $ `Hip Replacement Pre-Op Q Standing`                 <dbl> 1, 1, 1, 2, 1, 1, 4, ~
## $ `Hip Replacement Pre-Op Q Work`                     <dbl> 1, 1, 0, 1, 0, 0, 4, ~
## $ `Hip Replacement Pre-Op Q Score`                    <dbl> 20, 8, 7, 8, 7, 18, 3~
## $ `Hip Replacement Post-Op Q Pain`                    <dbl> 3, 4, 2, 2, 4, 2, 2, ~
## $ `Hip Replacement Post-Op Q Sudden Pain`             <dbl> 4, 4, 4, 2, 2, 2, 4, ~
## $ `Hip Replacement Post-Op Q Night Pain`              <dbl> 4, 4, 4, 1, 4, 2, 4, ~
## $ `Hip Replacement Post-Op Q Washing`                 <dbl> 4, 3, 3, 4, 3, 4, 4, ~
## $ `Hip Replacement Post-Op Q Transport`               <dbl> 4, 4, 2, 3, 3, 2, 4, ~
## $ `Hip Replacement Post-Op Q Dressing`                <dbl> 2, 4, 3, 3, 4, 4, 3, ~
## $ `Hip Replacement Post-Op Q Shopping`                <dbl> 4, 2, 0, 3, 2, 0, 4, ~
## $ `Hip Replacement Post-Op Q Walking`                 <dbl> 4, 3, 1, 4, 3, 2, 4, ~
## $ `Hip Replacement Post-Op Q Limping`                 <dbl> 3, 1, 1, 4, 2, 0, 3, ~
## $ `Hip Replacement Post-Op Q Stairs`                  <dbl> 4, 1, 1, 3, 2, 4, 4, ~
## $ `Hip Replacement Post-Op Q Standing`                <dbl> 3, 4, 3, 3, 4, 2, 4, ~
## $ `Hip Replacement Post-Op Q Work`                    <dbl> 4, 4, 2, 4, 2, 2, 3, ~
## $ `Hip Replacement Post-Op Q Score`                   <dbl> 43, 38, 26, 36, 35, 2~
## $ `Hip Replacement OHS Post-Op Q Predicted`           <dbl> 42.20017, 35.29577, 2~
```

Select age and quality of life score pre and post operation

```
age_EQ5D <- hip_data %>%
  select(`Age Band`,`Pre-Op Q EQ5D Index`, `Post-Op Q EQ5D Index`) %>%
  rename(Age = `Age Band`,
         EQ5D_Pre = `Pre-Op Q EQ5D Index`,
         EQ5D_Post = `Post-Op Q EQ5D Index`
         )
head(age_EQ5D)
```

```
## # A tibble: 6 x 3
##   Age   EQ5D_Pre EQ5D_Post
##   <chr>    <dbl>     <dbl>
## 1 *       NA         0.516
## 2 *       -0.003    NA
## 3 *       NA        -0.074
## 4 *        0.03      0.796
## 5 *       -0.239     0.62
## 6 *        0.159     0.691
```

Remove missing values

```
age_EQ5D$Age %>% unique()
```

```
## [1] "*"        "60 to 69" "70 to 79" "80 to 89" "50 to 59" "40 to 49"
```

```
age_EQ5D$Age %>% table()
```

```
## .
##        * 40 to 49 50 to 59 60 to 69 70 to 79 80 to 89
##     2309      275     2998     8303    11157     3878
```

```
age_EQ5D %>% summary()
```

```
##      Age               EQ5D_Pre          EQ5D_Post
##  Length:28920       Min.   :-0.5940   Min.   :-0.5940
##  Class :character   1st Qu.: 0.0300   1st Qu.: 0.6910
##  Mode  :character   Median : 0.3640   Median : 0.8150
##                     Mean   : 0.3357   Mean   : 0.7975
##                     3rd Qu.: 0.6200   3rd Qu.: 1.0000
##                     Max.   : 1.0000   Max.   : 1.0000
##                     NA's   :1794      NA's   :1104
```

```
age_EQ5D_noNa <- age_EQ5D %>%
  drop_na() %>%
  filter(Age !='*')

table(age_EQ5D_noNa$Age)
```

```
##
## 40 to 49 50 to 59 60 to 69 70 to 79 80 to 89
##      261     2808     7647     9986     3340
```

```
summary(age_EQ5D_noNa)
```

```
##      Age               EQ5D_Pre          EQ5D_Post
##  Length:24042       Min.   :-0.594   Min.   :-0.5940
##  Class :character   1st Qu.: 0.055   1st Qu.: 0.6910
##  Mode  :character   Median : 0.516   Median : 0.8150
##                     Mean   : 0.339   Mean   : 0.7995
##                     3rd Qu.: 0.656   3rd Qu.: 1.0000
##                     Max.   : 1.000   Max.   : 1.0000
```

Check that data is tidy

```
head(age_EQ5D_noNa)
```

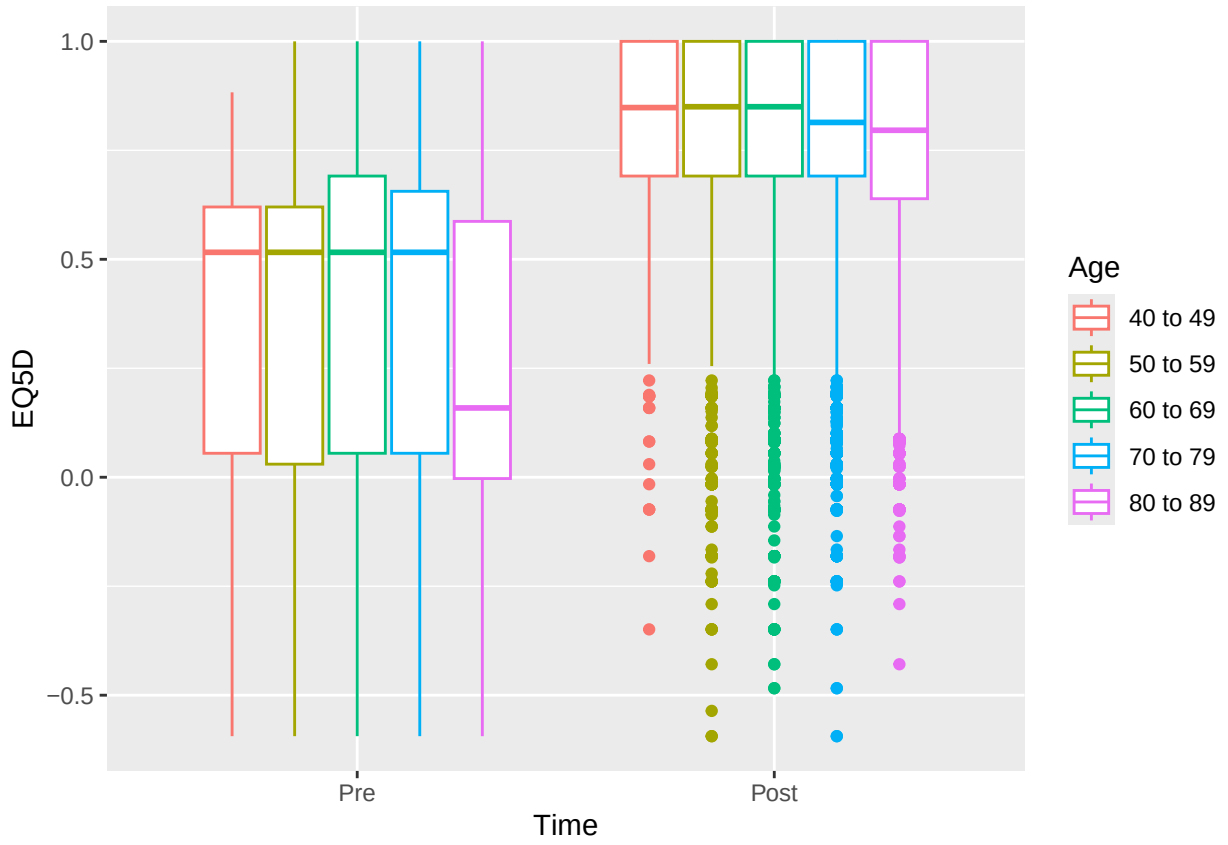
```
## # A tibble: 6 x 3
##   Age      EQ5D_Pre EQ5D_Post
##   <chr>       <dbl>     <dbl>
## 1 60 to 69   -0.016     0.516
## 2 60 to 69    0.159     0.743
## 3 60 to 69    0.03      0.727
## 4 60 to 69    0.587     0.85
## 5 60 to 69    0.623     0.796
## 6 60 to 69    0.691     1
```

```
tidy_age_EQ5D_noNa <- age_EQ5D_noNa %>%
  pivot_longer(c(EQ5D_Pre, EQ5D_Post),
               names_to = 'Time',
               names_prefix = 'EQ5D_',
               values_to = 'EQ5D'
               )

head(tidy_age_EQ5D_noNa)
```

```
## # A tibble: 6 x 3
##   Age      Time    EQ5D
##   <chr>    <chr>  <dbl>
## 1 60 to 69 Pre   -0.016
## 2 60 to 69 Post   0.516
## 3 60 to 69 Pre    0.159
## 4 60 to 69 Post   0.743
## 5 60 to 69 Pre    0.03
## 6 60 to 69 Post   0.727
```

Plot quality of life pre and post operation for each age group

```
tidy_age_EQ5D_noNa$Time <- factor(tidy_age_EQ5D_noNa$Time, levels = c('Pre','Post'))

tidy_age_EQ5D_noNa %>%
  ggplot() +
  geom_boxplot(aes(x = Time, y = EQ5D, colour = Age))
```


1.0
0.5
0.0
−0.5
EQ5D
Pre
Post
Time
Age
40 to 49
50 to 59
60 to 69
70 to 79
80 to 89