BIOS6621-Homework3

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9/24/2019

Based on the summary of dataset DVdata, I will assume ***hospcode*, *preced*, *sixmonth*,** and ***asa*** are categorical data; and ***weight*, *height*,** and ***bmi*** are continuous variables.

I probably will change the data into related data type before further analysis, other than leave the data as integer form.

There are few things we should pay more attention:

* 1. For ***hospcode*, *preced*, *sixmonth*,** and ***asa*,** those are categorical data with integer-levels, so we do not want to see decimals or other type numeric data type here. There would be more detailed exams for this type of errors.
  2. There are several NA missing data.
  3. For ***proced***, I would assume the data should be binary, however the value of 2 show up. This might be just typo or maybe the data was collected for extra information, for example with both procedures, or did it twice.

VAdata3 <- read.csv("C:/Users/Goodgolden5/Desktop/BIOS6621-Gary Grunwald/Week 04/VAdata3.csv")  
str(VAdata3)

## 'data.frame': 26255 obs. of 7 variables:  
## $ hospcode: int 1 1 1 1 1 1 1 1 1 1 ...  
## $ sixmonth: int 34 34 34 34 34 34 34 34 34 34 ...  
## $ proced : int 1 1 1 1 1 1 1 1 1 0 ...  
## $ weight : int 173 162 189 208 140 167 186 172 179 167 ...  
## $ height : int 59 58 57 52 53 60 60 56 59 56 ...  
## $ bmi : int 25 24 29 38 25 23 26 28 26 27 ...  
## $ asa : int 3 4 4 4 3 4 4 4 4 4 ...

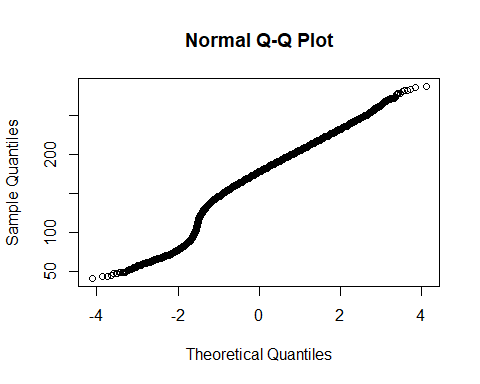
summary(VAdata3)

## hospcode sixmonth proced weight   
## Min. : 1.00 Min. :34.00 Min. :0.000 Min. : 41   
## 1st Qu.:11.00 1st Qu.:35.00 1st Qu.:1.000 1st Qu.:158   
## Median :22.00 Median :36.00 Median :1.000 Median :178   
## Mean :22.41 Mean :36.32 Mean :0.804 Mean :174   
## 3rd Qu.:33.00 3rd Qu.:37.00 3rd Qu.:1.000 3rd Qu.:197   
## Max. :44.00 Max. :39.00 Max. :2.000 Max. :288   
## NA's :106 NA's :104   
## height bmi asa   
## Min. :45 Min. : 3.00 Min. :1.000   
## 1st Qu.:56 1st Qu.:24.00 1st Qu.:4.000   
## Median :58 Median :27.00 Median :4.000   
## Mean :58 Mean :27.26 Mean :3.716   
## 3rd Qu.:60 3rd Qu.:30.00 3rd Qu.:4.000   
## Max. :70 Max. :75.00 Max. :5.000   
## NA's :104 NA's :149

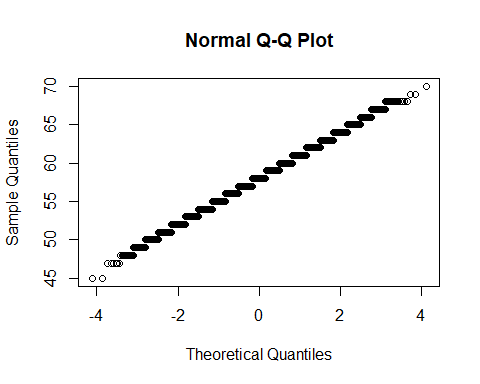
Then we can exam the normality of ***height,*** *and* ***bmi;*** and there are several extreme values.

* 1. The ***bmi*** has few values over 40, the max is 70, which seems impossible for real data. I would guess the mix used metric/imperial unit cause the problem.
  2. I would confirm the unit levels for the weight and height, then correct the errors.

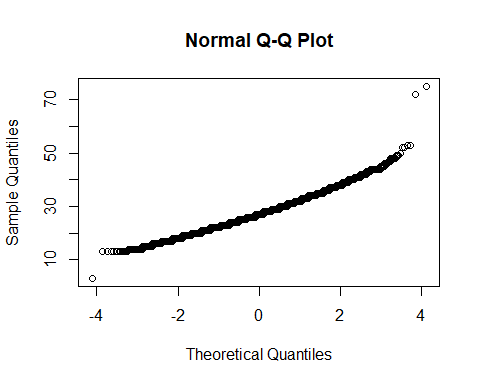
qqnorm(VAdata3$weight)



qqnorm(VAdata3$height)



qqnorm(VAdata3$bmi)

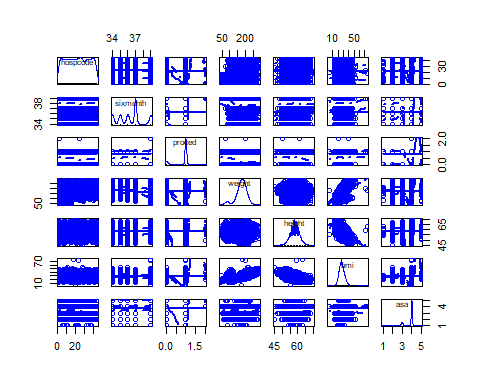


Then we check the bi-variant relations with matrix-scatterplot. Most of the variables are clustered with ***hospcod****e*, we should pay more attention on the effects from different hospitals. Still there are several outliner points within ***weight, height*,** and ***bmi*.**

library(car)

## Loading required package: carData

library(carData)  
scatterplotMatrix(~hospcode + sixmonth + proced + weight + height + bmi + asa, data = VAdata3)



There are a few individuals with missing values. Here I list out all the missing values. I probably will confirm with the researchers or make proper assumptions before the tests, other than delete those data. ***proced***and ***asa***are the two variables with the most missing data, but never occurs on the same individual. For ***height***and ***bmi****,* those two variables are correlated with each other. Those missing data are more clustered with a specific ***hospcode******30***group*.*

VAdata3[!complete.cases(VAdata3),]

## hospcode sixmonth proced weight height bmi asa  
## 332 1 37 <NA> 190 60 26 2  
## 381 1 37 <NA> 135 54 24 4  
## 397 1 37 <NA> 142 56 23 2  
## 450 1 37 1 167 59 24 NA  
## 468 1 37 0 183 61 25 NA  
## 483 1 37 <NA> 216 54 38 4  
## 501 1 37 1 197 51 39 NA  
## 626 1 39 <NA> 90 56 32 4  
## 654 1 39 1 111 56 40 NA  
## 960 2 37 <NA> 214 64 26 3  
## 1024 2 37 <NA> 146 55 25 4  
## 1066 2 37 1 140 54 24 NA  
## 1245 2 39 <NA> 83 48 39 4  
## 1284 3 34 1 200 62 27 NA  
## 1425 3 35 1 231 57 36 NA  
## 1512 3 36 0 182 59 26 NA  
## 1898 4 34 <NA> 176 58 26 3  
## 1902 4 34 1 161 55 27 NA  
## 2038 4 35 1 189 59 27 NA  
## 2170 4 37 <NA> 163 59 24 3  
## 2329 4 37 1 145 57 23 NA  
## 2399 4 39 <NA> 86 58 28 2  
## 2513 5 34 0 198 64 24 NA  
## 2605 5 35 1 184 54 32 NA  
## 2701 5 36 <NA> 227 58 34 4  
## 3046 6 34 0 163 61 22 NA  
## 3141 6 35 <NA> 128 57 20 2  
## 3305 6 36 <NA> 215 58 32 3  
## 3384 6 37 1 209 59 30 NA  
## 3536 6 37 <NA> 181 61 25 4  
## 3566 6 39 1 83 62 24 NA  
## 3744 7 35 1 136 59 20 NA  
## 3745 7 35 <NA> 187 60 26 4  
## 3806 7 35 0 201 60 29 NA  
## 3969 7 37 <NA> 186 58 28 4  
## 3972 7 37 1 157 54 27 NA  
## 3991 7 37 0 195 58 30 NA  
## 4114 7 37 1 198 57 30 NA  
## 4184 7 39 1 73 63 20 NA  
## 4203 7 39 1 105 58 34 NA  
## 4236 8 34 1 198 60 28 NA  
## 4253 8 34 <NA> 194 59 28 3  
## 4289 8 34 <NA> 235 57 36 4  
## 4312 8 34 <NA> 222 56 35 4  
## 4440 8 36 0 221 58 33 NA  
## 4506 8 36 1 193 60 27 NA  
## 4862 9 34 <NA> 156 54 27 4  
## 4959 9 35 1 171 60 24 NA  
## 4985 9 35 1 177 60 25 NA  
## 5045 9 35 1 196 53 35 NA  
## 5102 9 36 <NA> 156 56 25 4  
## 5145 9 37 1 196 63 25 NA  
## 5173 9 37 1 172 59 25 NA  
## 5212 9 37 <NA> 161 60 23 3  
## 5315 9 37 0 165 55 27 NA  
## 5424 9 39 1 80 59 26 NA  
## 5471 10 34 1 180 56 29 NA  
## 5575 10 35 1 179 60 25 NA  
## 5921 10 37 <NA> 184 62 24 4  
## 6147 11 35 1 187 60 26 NA  
## 6258 11 36 <NA> 151 58 23 3  
## 6343 11 37 1 190 63 24 NA  
## 6463 11 37 1 157 55 26 NA  
## 6510 11 39 1 87 52 35 NA  
## 6516 11 39 1 86 57 30 NA  
## 6549 11 39 1 89 62 26 NA  
## 6712 12 35 <NA> 195 57 30 4  
## 6720 12 35 <NA> 156 60 22 4  
## 6843 12 36 1 213 56 34 NA  
## 7366 13 35 <NA> 169 62 22 4  
## 7447 13 36 <NA> 210 59 31 4  
## 7463 13 36 <NA> 175 58 26 4  
## 7546 13 37 <NA> 201 57 31 4  
## 7616 13 37 1 234 56 38 NA  
## 7749 13 39 <NA> 75 56 27 4  
## 7785 14 34 <NA> 213 56 35 4  
## 7815 14 34 <NA> 181 57 28 4  
## 7819 14 34 <NA> 164 63 21 4  
## 7866 14 34 <NA> 152 53 27 4  
## 7880 14 35 <NA> 185 55 31 4  
## 8134 14 37 1 193 52 36 NA  
## 8136 14 37 <NA> 178 60 25 3  
## 8245 14 37 1 166 65 20 NA  
## 8256 14 37 <NA> 213 59 31 NA  
## 8395 15 34 <NA> 209 63 27 4  
## 8410 15 34 1 221 59 33 NA  
## 8419 15 34 1 172 59 25 NA  
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## 8935 15 39 <NA> 69 57 24 3  
## 9169 16 36 0 221 56 36 NA  
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## 9249 16 36 1 171 55 29 NA  
## 9340 16 37 1 156 54 27 NA  
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## 9509 16 39 0 74 56 26 NA  
## 9549 16 39 0 66 60 20 NA  
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## 10115 17 39 <NA> 178 55 29 4  
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## 10387 18 36 1 171 59 25 NA  
## 10724 18 39 1 164 53 29 NA  
## 10745 18 39 1 213 60 30 NA  
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## 11297 19 39 0 176 57 27 NA  
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## 12595 22 34 1 181 52 34 NA  
## 12828 22 36 1 141 57 22 NA  
## 12925 22 37 1 167 53 31 NA  
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## 13006 22 37 <NA> 165 58 25 4  
## 13013 22 37 1 189 59 28 NA  
## 13070 22 39 <NA> 135 55 22 4  
## 13073 22 39 <NA> 170 58 25 4  
## 13437 23 36 1 144 63 19 NA  
## 13442 23 36 1 169 54 30 NA  
## 13447 23 36 <NA> 120 56 19 2  
## 13622 23 37 <NA> 181 61 24 4  
## 13718 23 39 <NA> 197 51 38 4  
## 13759 24 34 1 185 57 29 NA  
## 13786 24 34 0 188 60 27 NA  
## 13943 24 35 <NA> 124 57 19 4  
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## 14042 24 36 1 158 58 23 NA  
## 14105 24 37 <NA> 177 57 27 4  
## 14254 24 37 1 171 57 26 NA  
## 14426 25 34 0 170 56 27 NA  
## 14479 25 34 <NA> 182 62 24 4  
## 14582 25 35 <NA> 167 58 25 4  
## 14686 25 36 1 198 61 27 NA  
## 15001 26 34 <NA> 192 53 35 4  
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## 15629 26 39 <NA> 173 54 30 4  
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## 22651 38 39 <NA> 166 53 30 4  
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