

Laryngoscope: Practice analysis

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2025-09-24

Laryngoscope

A laryngoscope is a medical instrument which is used to examine the larynx(voice box) during a laryngoscopy. It has lights and a lens, and can be used during intubation to insert a breathing tube in a patient who is having difficulty breathing.

The Laryngoscope dataset in R is part of the medical data package which comes from a study by Abdullah et al., published in Anesthesia Analgesia in 2011. It compares the Pentax AWS Video Laryngoscope and the Macintosh Laryngoscope. <https://search.r-project.org/CRAN/refmans/medicaldata/html/laryngoscope.html>.

Setting up my environment

Note: To set up the environment by installing and loading tidyverse, and the medicaldata in R datasets

```
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   1.5.2
## v ggplot2    4.0.0      v tibble    3.3.0
## v lubridate  1.9.4      v tidyr     1.3.1
## v purrr      1.1.0
```

```
## -- 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
```

```
install.packages("medicaldata")
```

```
## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.5'
```

```
## (as 'lib' is unspecified)
```

```
library(medicaldata)
```

Selecting the laryngoscope data and saving it as a tibble called 't_laryngoscope'

```
data("laryngoscope")
```

```
t_laryngoscope <- as_tibble(laryngoscope)
```

```
head(t_laryngoscope)
```

```
## # A tibble: 6 x 22
```

```
##   age gender  asa  BMI Mallampati Randomization attempt1_time attempt1_S_F
##   <dbl> <dbl> <dbl> <dbl>      <dbl>          <dbl>          <dbl>          <dbl>
## 1   51     0    3  56.2         1            0            29            1
## 2   52     0    3  44.6         2            0            29            1
```

```
## 3    37    0    3 41.6          1          0          31          0
## 4    20    0    3 46.3          2          0          31          0
## 5    35    0    3 61           2          0          21          1
## 6    39    0    3 44           2          0          10          1
## # i 14 more variables: attempt2_time <dbl>, attempt2_assigned_method <dbl>,
## #   attempt2_S_F <dbl>, attempt3_time <dbl>, attempt3_assigned_method <dbl>,
## #   attempt3_S_F <dbl>, attempts <dbl>, failures <dbl>,
## #   total_intubation_time <dbl>, intubation_overall_S_F <dbl>, bleeding <dbl>,
## #   ease <dbl>, sore_throat <dbl>, view <dbl>
```

Data Cleaning

The data columns are all presented as numerical data. In order to be able to explore the data using charts, I would need to convert some of the data to categorical data.

```
t_laryngoscope$gender <- factor(t_laryngoscope$gender, levels = c(1, 0), labels = c("Male", "Female"))
t_laryngoscope$asa <- as.factor(t_laryngoscope$asa)
t_laryngoscope$Mallampati <- as.factor(t_laryngoscope$Mallampati)
t_laryngoscope$Randomization <- factor(t_laryngoscope$Randomization, levels = c(1, 0), labels = c("Video", "Standard"))
t_laryngoscope$attempts <- as.factor(t_laryngoscope$attempts)
t_laryngoscope$failures <- as.factor(t_laryngoscope$failures)
t_laryngoscope$intubation_overall_S_F <- factor(t_laryngoscope$intubation_overall_S_F, levels = c(1, 0), labels = c("yes", "no"))
t_laryngoscope$bleeding <- factor(t_laryngoscope$bleeding, levels = c(1, 0), labels = c("yes", "no"))
t_laryngoscope$sore_throat <- factor(t_laryngoscope$sore_throat, levels = c(3, 2, 1, 0), labels = c("severe", "moderate", "mild", "none"))

head(t_laryngoscope)
```

```
## # A tibble: 6 x 22
##   age gender asa    BMI Mallampati Randomization attempt1_time attempt1_S_F
##   <dbl> <fct> <fct> <dbl> <fct>         <fct>         <dbl>         <dbl>
## 1   51 Female 3     56.2 1         Standard         29             1
## 2   52 Female 3     44.6 2         Standard         29             1
## 3   37 Female 3     41.6 1         Standard         31             0
## 4   20 Female 3     46.3 2         Standard         31             0
## 5   35 Female 3     61    2         Standard         21             1
## 6   39 Female 3     44    2         Standard         10             1
## # i 14 more variables: attempt2_time <dbl>, attempt2_assigned_method <dbl>,
## #   attempt2_S_F <dbl>, attempt3_time <dbl>, attempt3_assigned_method <dbl>,
## #   attempt3_S_F <dbl>, attempts <fct>, failures <fct>,
## #   total_intubation_time <dbl>, intubation_overall_S_F <fct>, bleeding <fct>,
## #   ease <dbl>, sore_throat <fct>, view <dbl>
```

Outlining the column names to make them easily accessible.

```
colnames(t_laryngoscope)

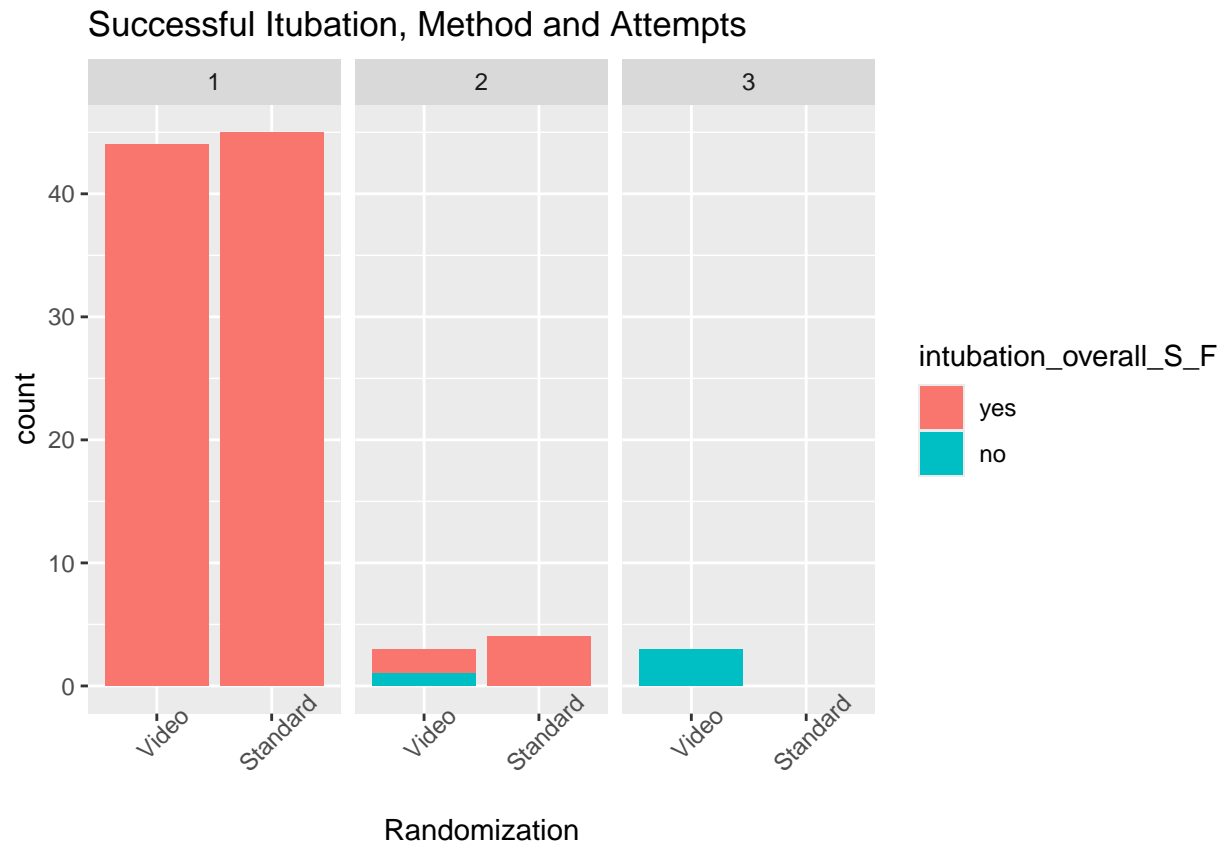
## [1] "age" "gender"
## [3] "asa" "BMI"
## [5] "Mallampati" "Randomization"
## [7] "attempt1_time" "attempt1_S_F"
## [9] "attempt2_time" "attempt2_assigned_method"
## [11] "attempt2_S_F" "attempt3_time"
## [13] "attempt3_assigned_method" "attempt3_S_F"
## [15] "attempts" "failures"
## [17] "total_intubation_time" "intubation_overall_S_F"
## [19] "bleeding" "ease"
```

```
## [21] "sore_throat"          "view"
```

Data Exploration Using Plots

Using scatter plots and bar charts to explore the data for significant insights.

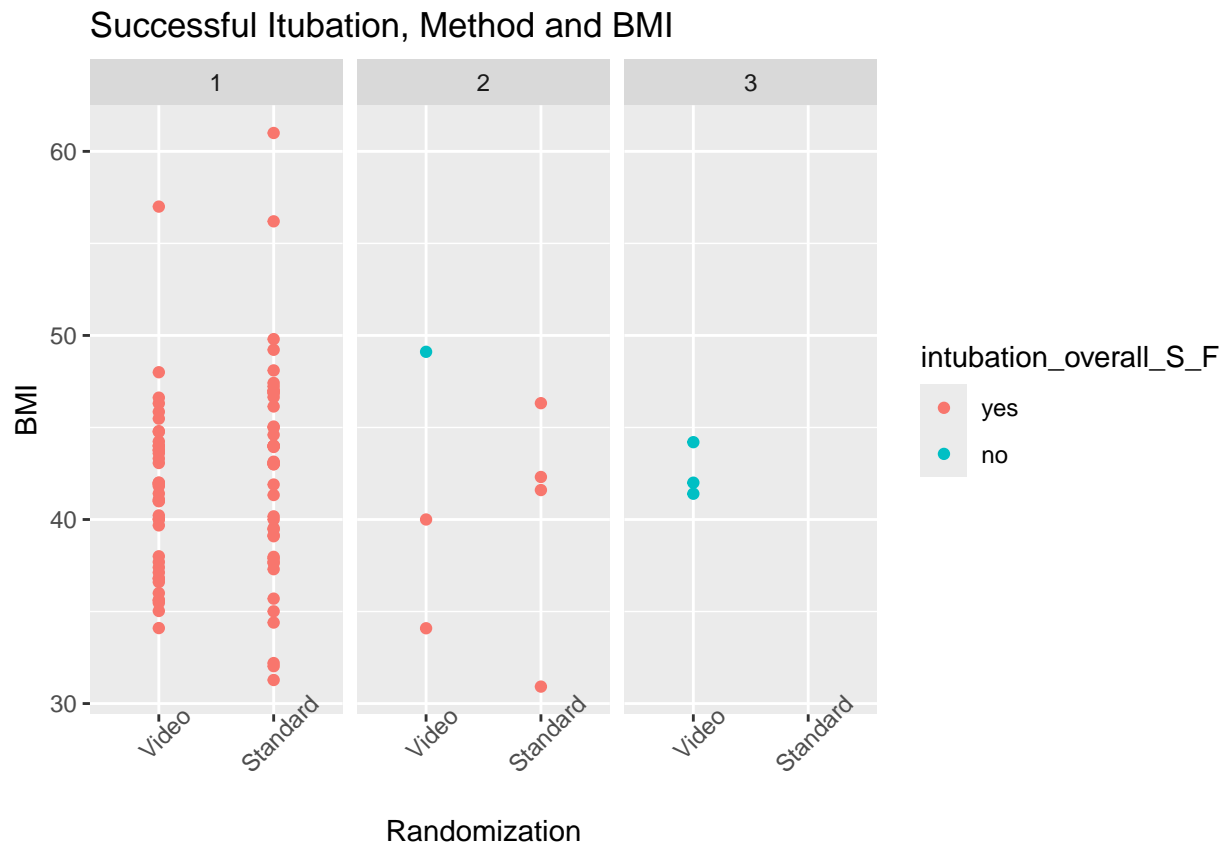
```
ggplot(data = t_laryngoscope) +  
  geom_bar(mapping = aes(x = Randomization, fill = intubation_overall_S_F)) +  
  facet_wrap(~ attempts) +  
  theme(axis.text.x = element_text(angle = 45)) +  
  labs(title="Successful Itubation, Method and Attempts")
```



This plot indicates that both methods are quite effective. However, In a few cases, There is need for a secod or even a third attempt at intubation. Is this in anyway related to the level of obesity as measured by the BMI?

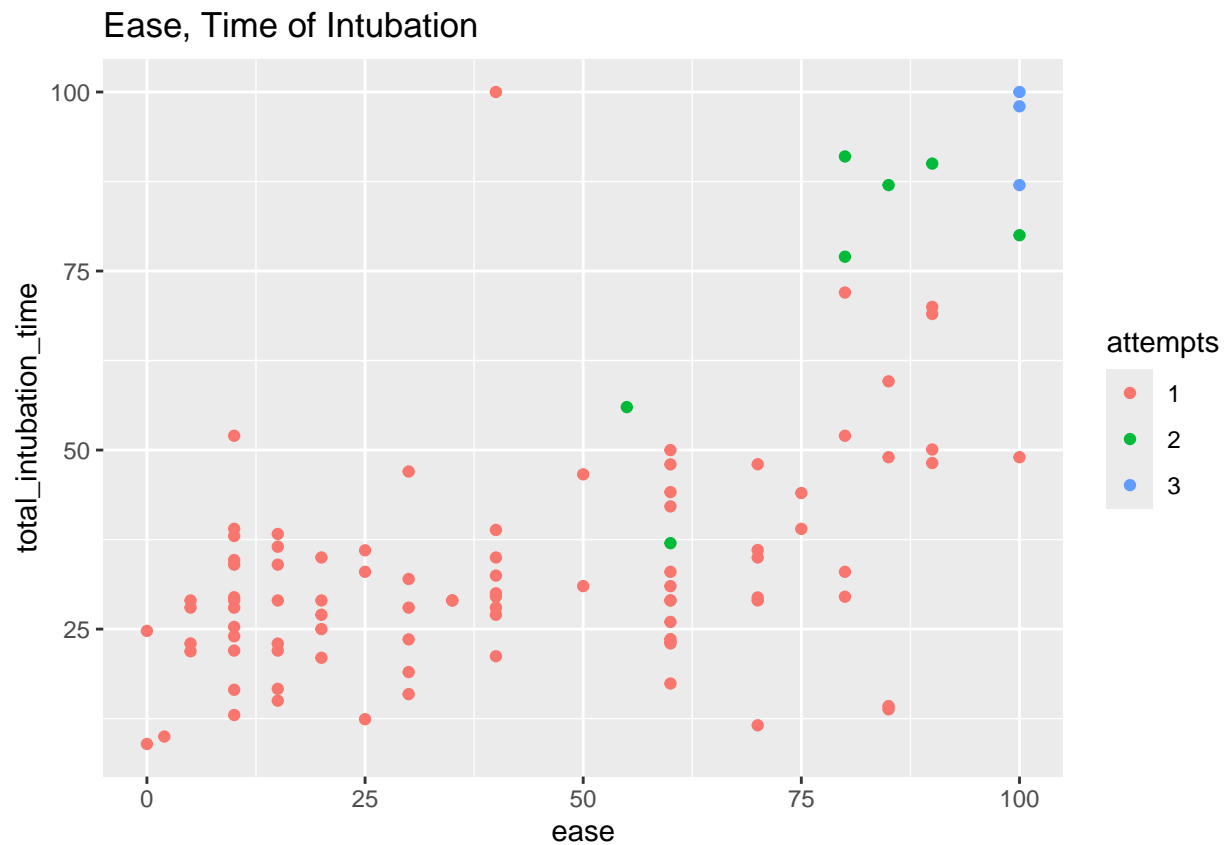
```
ggplot(data = t_laryngoscope) +  
  geom_point(mapping = aes(x = Randomization, y = BMI, color =intubation_overall_S_F)) +  
  facet_wrap(~ attempts) +  
  theme(axis.text.x = element_text(angle = 45)) +  
  labs(title="Successful Itubation, Method and BMI")
```

```
## Warning: Removed 2 rows containing missing values or values outside the scale range  
## (`geom_point()`).
```



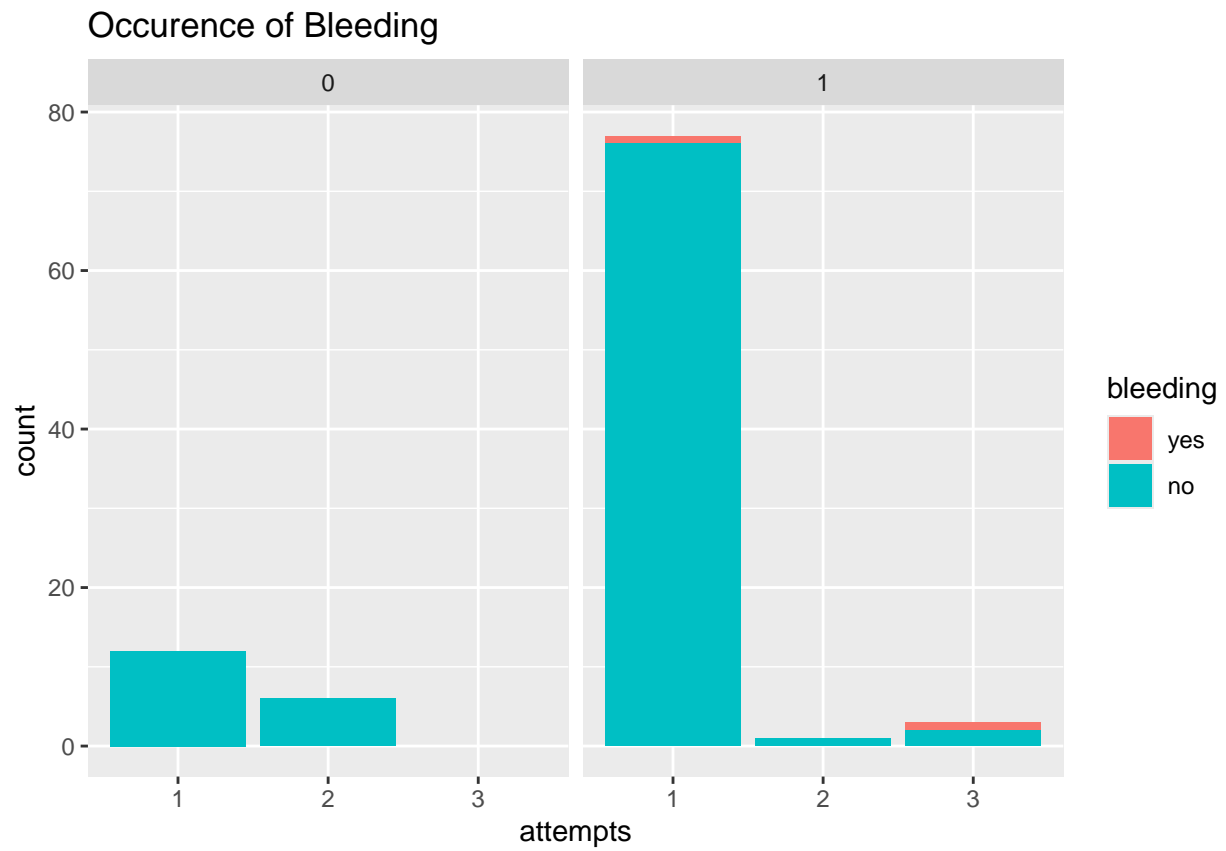
This doesn't indicate that at all. In fact, majority of the patients have BMI between 30 and 50. Those with higher, had a successful intubation on the first attempt, and only a few who are slightly above 40 needed a third attempt.

```
ggplot(data = t_laryngoscope) +
  geom_point(mapping = aes(x = ease, y = total_intubation_time, colour = attempts)) +
  labs(title="Ease, Time of Intubation")
```



This plot indicates that easier intubations are likely to require only one attempt and take less time.

```
ggplot(data = t_laryngoscope) +
  geom_bar(mapping = aes(x = attempts, fill = bleeding )) +
  facet_wrap(~ view) +
  labs(title="Occurence of Bleeding")
```



Finally, this plot indicates that bleeding can occur even when the glottic view is good. However occurrence of bleeding seems to be very few.