Preoperative Atelectasis

Part 2: Descriptive characteristics and map

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Setup

Packages used

```
if (!require("pacman", quietly = TRUE)) {
  install.packages("pacman")
}


pacman::p_load(
  tidyverse, # Used for basic data handling and visualization.
  table1, #Used to create table of descriptive characteristics of sample.
  RColorBrewer, #Color palettes for data visualization.
  gridExtra, #Used to arrange multiple ggplots in a grid.
  grid, #Used to arrange multiple ggplots in a grid.
  rnaturalearth, #Used to extract geographical data to create maps.
  rnaturalearthhires, #Used together with the prior package to create map.
```

```
  sf, #Used together with the prior package to create map.
  plotly, #Used together with prior two packages to create map.
  flextable, #Used to export tables.
  officer  #Used to export tables.
)
```

Session and package dependencies

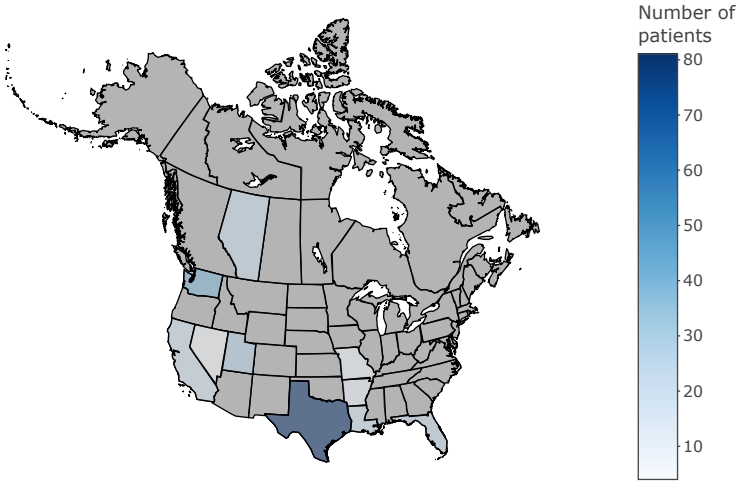
```
R version 4.3.2 (2023-10-31 ucrt)
Platform: x86_64-w64-mingw32/x64 (64-bit)
Running under: Windows 11 x64 (build 22621)

Matrix products: default


locale:
[1] LC_COLLATE=Spanish_Mexico.utf8  LC_CTYPE=Spanish_Mexico.utf8
[3] LC_MONETARY=Spanish_Mexico.utf8 LC_NUMERIC=C
[5] LC_TIME=Spanish_Mexico.utf8

time zone: Europe/Berlin
tzcode source: internal

attached base packages:
[1] grid      stats     graphics  grDevices utils     datasets  methods
[8] base

other attached packages:
 [1] remotes_2.4.2.1          officer_0.6.3            flextable_0.9.4
 [4] plotly_4.10.3            sf_1.0-14                rnaturalearthhires_0.2.1
 [7] rnaturalearth_0.3.4      gridExtra_2.3            RColorBrewer_1.1-3
[10] table1_1.4.3             lubridate_1.9.3          forcats_1.0.0
[13] stringr_1.5.0            dplyr_1.1.3              purrr_1.0.2
[16] readr_2.1.4              tidyr_1.3.0              tibble_3.2.1
[19] ggplot2_3.4.4            tidyverse_2.0.0          pacman_0.5.1
```

State of residence of participants

Map generated with the accompanying script ***Map_USA_Canada.R***

This map was built by partly using code adapted from contribution by cpsievert.

State	n
Texas	81
Washington	39
Utah	27
Alberta	21
Florida	20
California	16
Louisiana	16
Arkansas	7
Missouri	5
Nevada	4



Distribution of numerical variables

Distributions were examined with the accompanying sourced function ***distribution_numerical_variables.R***

Near normal distribution:
- Age: light tails
- height: heavy right tail, 4 outliers right
- hb: heavy tails, bilateral outliers
- hct: heavy tails, bilateral outliers
- leu: near normal, bilateral outliers
- neu_absolute: heavy right tail, two right outliers
- linf_absolute: heavy right tail, bilateral outliers (more right)
- mon_absolute: heavy right tail, bilateral outliers (more right)
- platelets: two right outliers
- urea: four right outliers
- creatinine: three right outliers

Distribution not normal:
- Weight: right-skewed, outliers are verified observations of extreme weight.
- BMI: right-skewed, outliers are verified observations of extreme BMI.
- spo2_VPO: Left-skewed
- neu_percent: left-skewed
- linf_percent: right-skewed
- glucose: right-skewed
- mon_percent: observations around only 5 data points. Will not use this variable, only absolute monocytes will be used.
- altitude: distribution not clear as values are quite apart an concentrate around single states with diferring mean altitudes. Will attempt to model a smooth term or categorical term in subsequent analyses.

Outcome variable:
- atelectasis_percent: Zero-inflated. Would be difficult to manage as categorical ordinal due to low number of patients in some categories. Will re-assess alongside subsequent analyses to decide.

Characteristics of participants

Table 1 generated with the accompanying sourced script ***table1_arguments.R***

Characteristics of participants are shown for the total sample and by obesity class category as defined by the World Health Organization:

- Class 1, BMI [30,35) kg/m2
- Class 2, BMI [35,40) kg/m2
- Class 3, BMI >40 kg/m2

Characteristics of participants according to BMI class are shown in **Table 1**.

Table 1

	Total	Class 1 Obesity	Class 2 Obesity	Class 3 Obesity
	(N=236)	(N=62)	(N=53)	(N=121)
Sex				
Man	22 (9.3%)	2 (3.2%)	5 (9.4%)	15 (12.4%)
Woman	214 (90.7%)	60 (96.8%)	48 (90.6%)	106 (87.6%)
Age (years)				
Mean (SD)	40.3 (9.87)	42.1 (10.3)	40.8 (9.25)	39.1 (9.82)
Weight (kilograms (kg))				
Median [Q1, Q3]	111 [97.4, 130]	88.8 [84.2, 95.7]	107 [102, 112]	128 [114, 142]
Height (meters (m))				
Mean (SD)	1.67 (0.0822)	1.66 (0.0631)	1.69 (0.0856)	1.67 (0.0889)
Body mass index (kg/m²)				
Median [Q1, Q3]	40.3 [34.6, 46.0]	33.0 [31.5, 33.8]	38.3 [36.6, 39.1]	45.6 [42.2, 51.1]
Surgical procedure				
LBGS	31 (13.1%)	5 (8.1%)	9 (17.0%)	17 (14.0%)
OAGB	5 (2.1%)	1 (1.6%)	1 (1.9%)	3 (2.5%)
RYGB	6 (2.5%)	1 (1.6%)	1 (1.9%)	4 (3.3%)
SG	189 (80.1%)	52 (83.9%)	41 (77.4%)	96 (79.3%)
ARISCAT risk group				
Intermediate Risk	61 (25.8%)	18 (29.0%)	12 (22.6%)	31 (25.6%)
Low Risk	175 (74.2%)	44 (71.0%)	41 (77.4%)	90 (74.4%)
Oxygen saturation (SpO2) (%)				

	Total	Class 1 Obesity	Class 2 Obesity	Class 3 Obesity
Median [Q1, Q3]	96.0 [93.0, 97.0]	97.0 [95.0, 97.8]	96.0 [94.0, 97.0]	94.0 [92.0, 97.0]
Mean altitude (meters)				
Median [Q1, Q3]	519 [519, 806]	519 [313, 806]	519 [519, 885]	519 [519, 806]
Hypertension				
No	177 (75.0%)	52 (83.9%)	40 (75.5%)	85 (70.2%)
Yes	59 (25.0%)	10 (16.1%)	13 (24.5%)	36 (29.8%)
Diabetes				
No	211 (89.4%)	58 (93.5%)	48 (90.6%)	105 (86.8%)
Yes	25 (10.6%)	4 (6.5%)	5 (9.4%)	16 (13.2%)
Obstructive sleep apnea				
No	218 (92.4%)	60 (96.8%)	50 (94.3%)	108 (89.3%)
Yes	18 (7.6%)	2 (3.2%)	3 (5.7%)	13 (10.7%)
Hypothyroidism				
No	213 (90.3%)	55 (88.7%)	50 (94.3%)	108 (89.3%)
Yes	23 (9.7%)	7 (11.3%)	3 (5.7%)	13 (10.7%)
Dyslipidemia				
No	218 (92.4%)	58 (93.5%)	48 (90.6%)	112 (92.6%)
Yes	18 (7.6%)	4 (6.5%)	5 (9.4%)	9 (7.4%)
Antidepressants use				
No	142 (60.2%)	36 (58.1%)	33 (62.3%)	73 (60.3%)
Yes	94 (39.8%)	26 (41.9%)	20 (37.7%)	48 (39.7%)
CO-RADS				
CO-RADS 1	230 (97.5%)	61 (98.4%)	51 (96.2%)	118 (97.5%)
CO-RADS 2	6 (2.5%)	1 (1.6%)	2 (3.8%)	3 (2.5%)
Glucose (mg/dL)				
Median [Q1, Q3]	83.0 [74.0, 92.0]	83.0 [77.0, 90.0]	81.0 [70.0, 92.0]	83.0 [74.0, 92.0]
Creatinine (mg/dL)				
Mean (SD)	0.758 (0.146)	0.773 (0.115)	0.744 (0.144)	0.757 (0.160)
Urea (mg/dL)				
Mean (SD)	21.4 (6.70)	22.9 (6.08)	20.5 (6.77)	21.1 (6.89)
Hemoglobin (g/dL)				
Mean (SD)	14.5 (1.21)	14.5 (1.20)	14.5 (1.17)	14.6 (1.24)
Hematocrit (%)				

	Total	Class 1 Obesity	Class 2 Obesity	Class 3 Obesity
Mean (SD) WBC count (10^3/µL)	42.8 (3.33)	42.6 (3.32)	42.6 (3.22)	42.9 (3.41)
Mean (SD) Neutrophils (absolute) (10^3/µL)	7.83 (1.76)	7.81 (1.74)	7.71 (1.76)	7.89 (1.78)
Mean (SD) Lymphocytes (absolute) (10^3/µL)	4.97 (1.42)	4.94 (1.39)	4.83 (1.39)	5.04 (1.46)
Mean (SD) Monocytes (absolute) (10^3/µL)	2.70 (0.811)	2.71 (0.802)	2.70 (0.920)	2.69 (0.771)
Mean (SD) Platelets (cells/µL)	2.70 (0.811)	2.71 (0.802)	2.70 (0.920)	2.69 (0.771)
Mean (SD)	316 (64.4)	307 (67.6)	319 (63.2)	320 (63.2)

NOTE: The **ASA** physical status variable has not been included in analyses since the updated version of ASA consulted in October 2023 classifies obesity (30<BMI<40) as ASA 2 and obesity (BMI 40) as ASA 3. The distribution of frequencies of ASA~obesity class in this dataset does not match such definition. This occurred since an outdated version of ASA that did not include obesity was likely used by clinicians when writing the preoperative assessment medical note:

```
       Class 1 Obesity Class 2 Obesity Class 3 Obesity
ASA 1               31              18               3
ASA 2               29              34              85
ASA 3                0               0              32
```