

# REPORT

## Effects of Anaesthetics

Case A



ALPINE  
INSIGHTS



# ALPINE INSIGHTS

by Michael Bigler, Dakota Cuellar, Ilyana El Mendili,  
William Elkiess, Tania Loureiro and Liam Phan



# Executive Summary



This report analyses data from 80 patient observations to determine whether there are differences in the time patients wake up from four different types of anaesthetics (A, B, C, and D).

The report concludes that there was no statistical difference between the tested anaesthetics, meaning health professionals can freely choose between them in future usage. Understanding the different characteristics of anaesthetics can ultimately improve patient care and the hospital can avoid unnecessary expenses that may arise from using a more expensive anaesthetic without any additional benefit.

# Introduction

Anaesthetics are essential medications used to provide patients with pain relief during surgical or medical procedures. Different types of anaesthetics are available, and each has its unique characteristics.

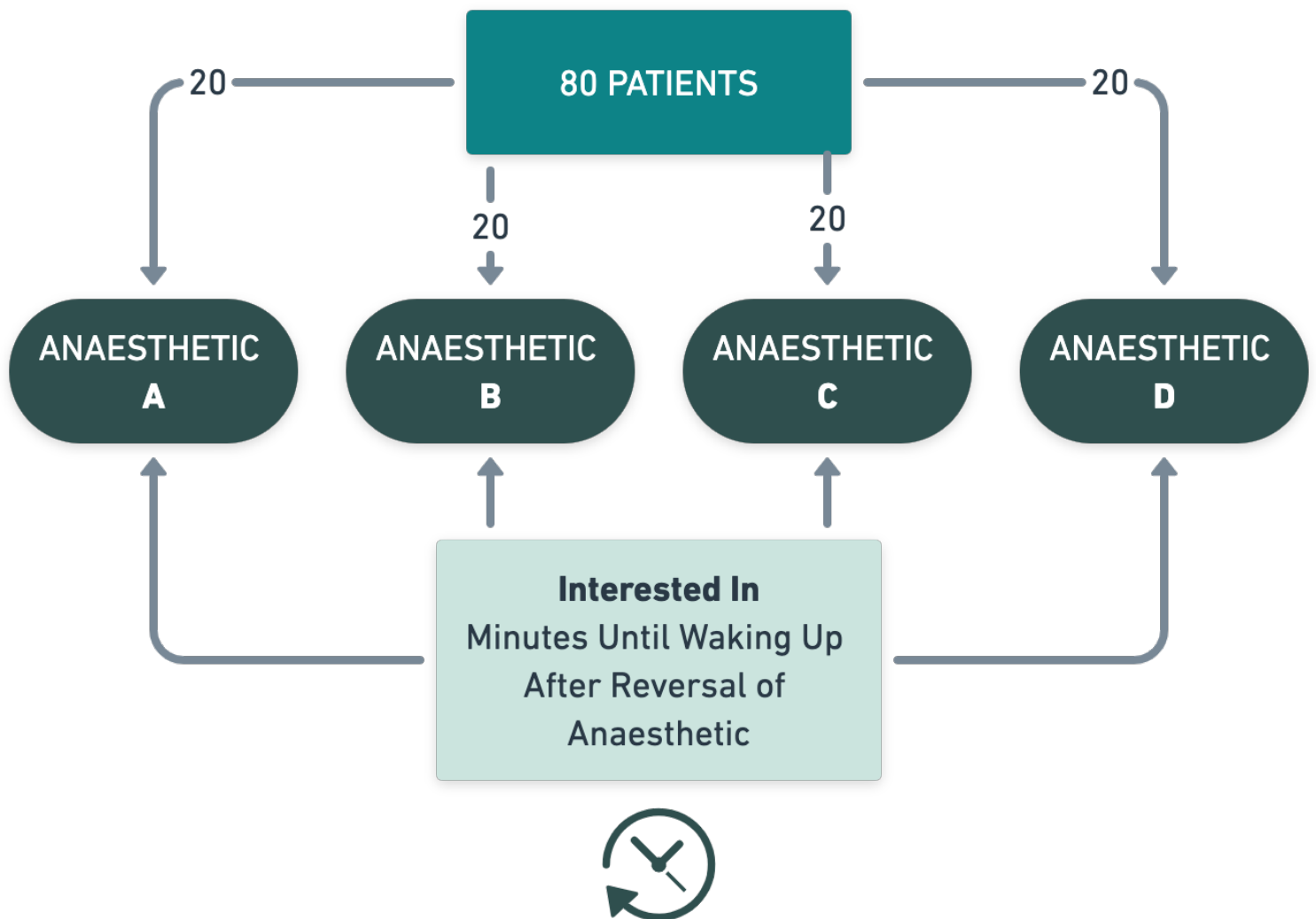
In this report, we will be analysing the data provided by our client, which consists of 80 patient observations. Each patient was randomly assigned one of four types of anaesthetics A, B, C, or D. The time in minutes was measured starting from the anaesthetic reversal until the patient woke up. Our primary objective is to determine whether there are differences in the time patients wake up from each of the four types of anaesthetics. Additionally, we will be looking for any significant observations that

differ from the standard procedure. By understanding the anaesthetics, doctors can choose the best type for each patient and procedure, which can ultimately improve patient care. To illustrate our data, we used graphical representations such as boxplots and histograms so that our clients can better visualise the differences between the group distributions.

Our goal is to provide our clients with valuable insights that can help improve patient outcomes and the overall quality of care.



## Client Experiment



# Results

As discussed in the Introduction, the primary objective of our analysis is to determine whether there are any significant differences in the time patients wake up from each anesthetic. To achieve this goal, we conducted a statistical analysis to understand the data.



## Computation of the medians

First of all, we calculated the median in minutes from the reversal of the anaesthetic until the patient opened the eyes for each anaesthetic. The median means that half of the patients in each group took longer than the median time to wake up, and the other half of the patients in each group took less time than the median time to wake up.

The median is useful for skewed distributions (as you can see in Figure 3) and when we have some outliers (Figure 2). In a statistical way, we provide a statistical test to see if there is any evidence of differences between the effects of the four anaesthetics or not. Since the Normality Assumption doesn't fit, we chose to do a Kruskal-Wallis test. The Figure 1 in the appendix illustrates with more details the process of our choice.

The process of testing two hypotheses helps us to make a good decision. We calculate the p-value, a measure from the sample that gives us the information of how likely the null hypothesis ( $H_0$ ) is true. The lower the p-value, the less likely it is that the observed difference occurred by chance. In our experiment, we have a p-value higher than 0.10, which suggests that the observed difference in median times could have occurred by chance.

Therefore, we fail to reject the null hypothesis  $H_0$  and thus there is no statistically significant difference between the four anaesthetic.

It simply means that the observed differences in the median times could have occurred by chance and then, there is not enough evidence to suggest that any one of the four types of anaesthetic is consistently faster or slower than the others in terms of the time to recovery.

## Test difference in medians with Kruskal-Wallis test



**$H_0$**  : The medians for all anaesthetics are equal.

**$H_A$**  : At least one anaesthetic median is different from the others.

Median in minutes for each anaesthetic

A	B	C	D
3.5 min	2 min	2 min	3 min



## Conclusion and recommendations

In conclusion, it can be said that there was no statistical difference between the different anaesthetics that were tested. This means that for future usage the hospital can freely choose between the tested anaesthetics. In order to improve the accuracy of the research, we advise the client to provide us with more specific and qualitative data on the patient for comparison. Variables such as age, gender and operations undergone by the patient would be necessary information for a better analysis.

We also would like to point out that the reliability of the research would have increased with a larger sample size. Due to this lack of data, we cannot certify that the differences between the four anaesthetics are solely linked to the characteristics of the anaesthetics. Finally, as a last piece of advice, we would like our client to bear in mind that before making any decision about anaesthetics, it is vital to consult a health professional, even if a lot of data is provided.



# References

www.hoopcare.com. (n.d.). How Long Does It Take to Wake Up From Anesthesia?

• Information & Articles on Anesthesi & Surgery • HoopCare. [online] Available

at: <https://www.hoopcare.com/us-blog/how-long-does-it-take-to-wake-up-from-anesthesia#:~:text=to%20wake%20up>. - [Accessed 21 Mar. 2023].

Statistics Solutions. (2019). Kruskal-Wallis Test - Statistics Solutions. [online] Available

at: <https://www.statisticssolutions.com/kruskal-wallis-test/>. - [Accessed 21 Mar. 2023].

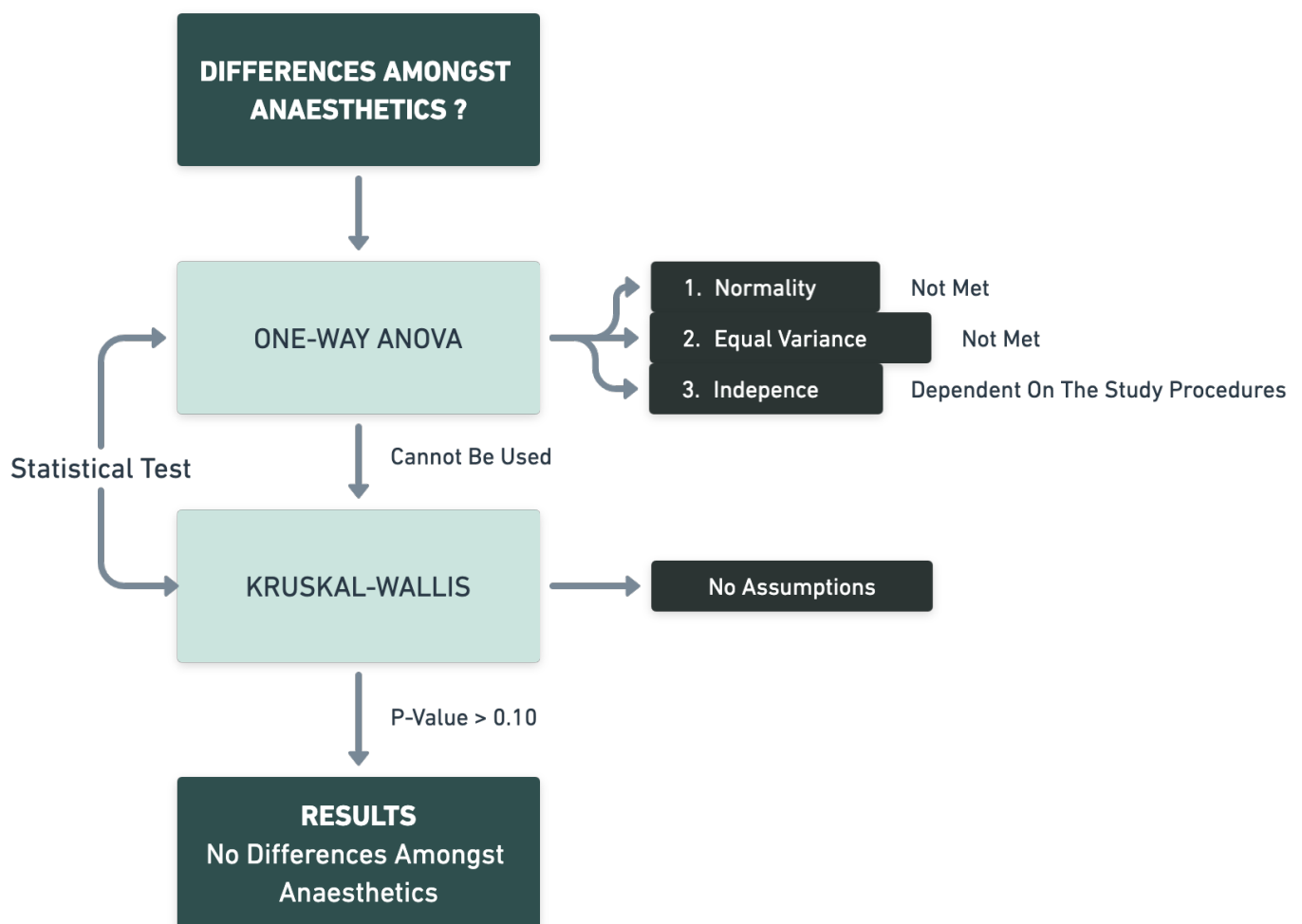
BOREAL. (n.d.). Snowy Mountains in the Swiss Alps. [online] Available at: [https://www.borealc.com/financial-debt-is-now-high-yield-debt/snowy-mountains-in-the-swiss-](https://www.borealc.com/financial-debt-is-now-high-yield-debt/snowy-mountains-in-the-swiss-alps/)

[alps/](https://www.borealc.com/financial-debt-is-now-high-yield-debt/snowy-mountains-in-the-swiss-alps/) [Accessed 27 Mar. 2023].

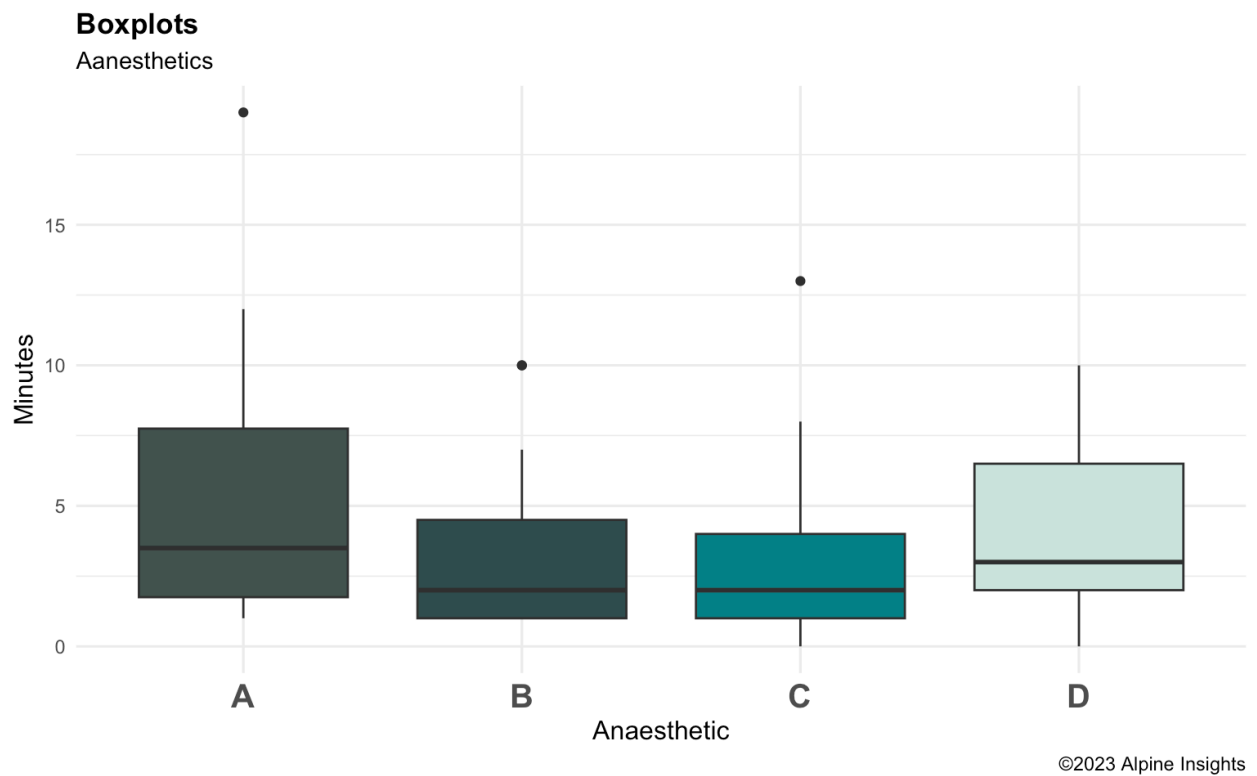


# Appendix

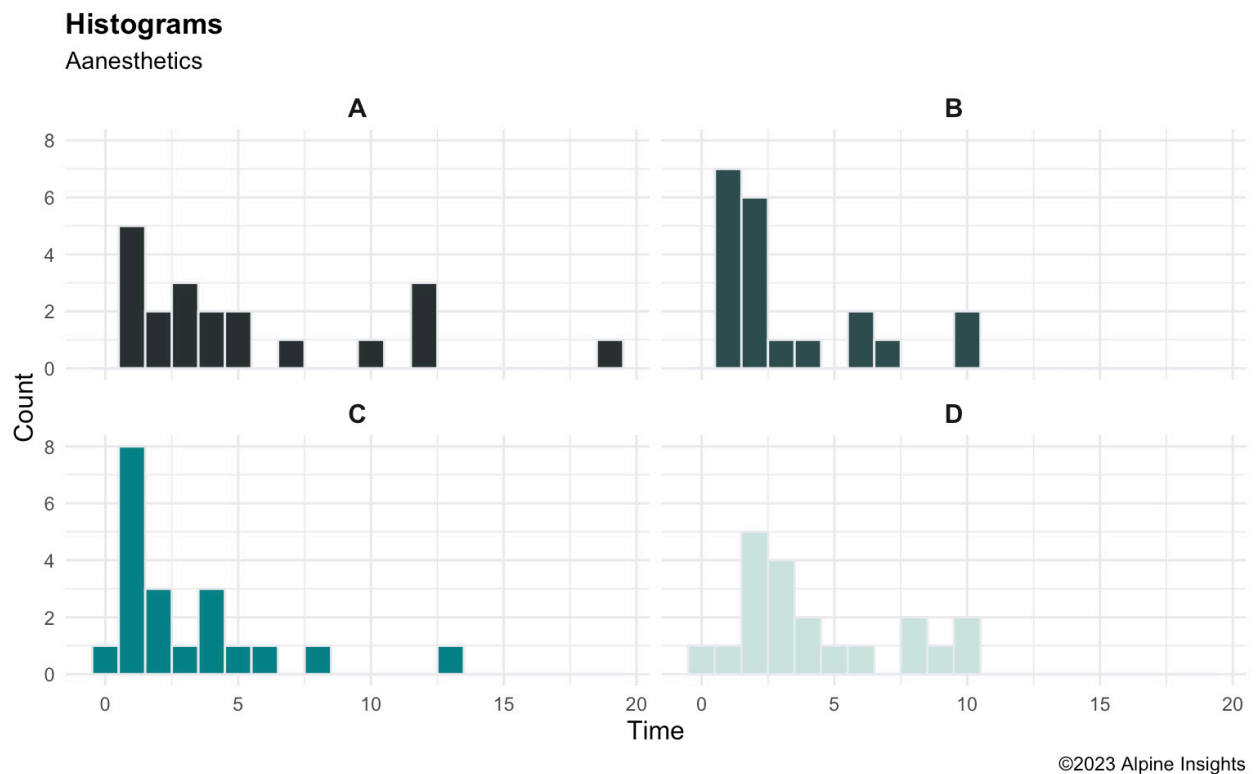
→ Figure 1 - Statistical Analysis Process



## → Figure 2 - Boxplot of Anaesthetic Groups



## → Figure 3 - Histograms of Anaesthetic Groups



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