Homework 2

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STA 440 / Spring 2025

Introduction

Turan et al. (2015) aimed to examine potential associations between obstructive sleep apnea and blood pressure during weight loss surgeries.

The full paper and complete dataset, along with brief introduction to the paper and data dictionary, are available in the course repository.

Relationship between Chronic Intermittent Hypoxia and Intraoperative Mean Arterial Pressure in Obstructive Sleep Apnea Patients Having Laparoscopic Bariatric Surgery

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ABSTRACT

Background: Recurrent nocturnal hypoxemia in obstructive sleep apnea enhances sympathetic function, decreases baroreceptor sensitivity, and weakens peripheral vascular responses to adrenergic signals. The authors hypothesized that the percentage of total sleep time spent at oxyhemoglobin saturation (Sao_2) less than 90% and minimum nocturnal Sao_2 on preoperative polysomnography are associated with decreased intraoperative mean arterial pressure.

Methods: The authors examined the records of all patients who had laparoscopic bariatric surgery at Cleveland Clinic between 2005 and 2009 and an available polysomnography study. The authors assessed the relationships between the percentage of total sleep time spent at Sao_2 less than 90% and minimum nocturnal Sao_2, and the time-weighted average of mean arterial pressure. The authors used multivariable regression models to adjust for prespecified clinical confounders.

Results: Two hundred eighty-one patients were included in the analysis. The average change in the time-weighted average of mean arterial pressure was −0.02 (97.5% CI, −0.08, 0.04) mmHg for each 1% absolute increase in the percentage of sleep time spent at Sao_2 less than 90% ($P = 0.50$). The average change was −0.13 (97.5% CI, −0.27, 0.01) mmHg, for each 1% absolute decrease in the minimum Sao_2 ($P = 0.04$ > significance criterion of 0.025, Bonferroni correction). An unplanned analysis estimated 1% absolute decrease in minimum Sao_2 was associated with −0.22 (98.75% CI, −0.39, −0.04) mmHg, change in mean arterial pressure ($P = 0.002$) in the time period between endotracheal intubation and trocar insertion.

Conclusion: Recurrent nocturnal hypoxemia in obstructive sleep apnea is not a risk marker for intraoperative hypotension.

(ANESTHESIOLOGY 2015; 122:64-71)

Logistics (part 1 of 3)

Note that this homework assignment is due **Friday, February 14** and graded on accuracy, to be turned in on Gradescope (no need to make a repository or anything).

This is an individual assignment; you are not allowed to work with any other students, though you are allowed to use any existing resources (books, notes, internet resources, etc.), or AI tools in accordance with the class policy.

By submitting this assignment, you pledge to uphold the Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors;
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.

Logistics (part 2 of 3)

You are asked to reproduce all results from Table 2 (30 points), **all numerical results** in the "Secondary Analyses" paragraph (30 points), Figure 2 (20 points), as well as write a brief summary report of your experience (20 points, details on the next page).

Files turned in without code will be assigned a grade of 0 (ok to just attach a text file in R or something). Code which has errors (beyond installing packages or pointing to local file directories) will result in grade penalties.

Logistics (part 3 of 3)

- You must provide a reproducible file (any computing package is fine - R, Python, etc.) that produces the figures, tables, and report. Submit your source code along with the deliverables.
- Figure 2 does not need to match exactly in terms of graphics (I think they made their plot in Excel), but it must contain the same information as their figure (including axis labels with appropriate subscripts, titles, and all data-related features).
- Table 2 does not need to match exactly in terms of format (so don't worry about trying to directly format in R or Python), but you **must** provide the same information to the same level of precision. It's fine to split this up into smaller subtables or simply clearly label where each number is coming from - I am looking for whether you are able to exactly reproduce the values.
- In your report, include how long it took you to reproduce the results from these figures and tables. Describe your experience reproducing the work, and whether it matched your expectations going into the topic. As well, if you failed to reproduce any of these results, explain what additional information is needed (for instance, clearer description of modeling approach, etc.), or potential sources of discrepancy (e.g., small rounding issues that compounded later, etc.).