Case Study 3
Correlation is not Cause

Case Presentation:

A nurse on your unit is reading a recent article that describes the impact of mobility on delirium. The article presents data from a multi-center study in which the investigators examined the frequency of mobility among subjects hospitalized for over 3 days. The method section of the manuscript describes that a retrospective chart audit was performed of all patients who remained in the hospital for at least 3 days (72 hours). Data was abstracted (transferred from the medical record to the research record) to include: patient demographics, the first time a patient was ambulatory, the number of IVs infusing, the use of narcotic or sedative medications, and the incidence of delirium.

The study results include the following table:

Table 1. Main results

	Delirium present (N=278)	No evidence of Delirium (N=1,546)	p-value
Mean Age (S.D.)	63.3 (11.22) years	63.8 (11.18) years	0.424
Sex			0.794
Female	54%	53.1%	
Male	46%	46.9%	
Mean Ambulation day	7.8	7.0	0.039
Mean number of IV's Infusing	1.9	1.8	0.214
Narcotic use			0.992
Yes	231(83.1%)	1285 (83.1%)	
No	47 (16.9%)	261 (16.9%)	
Sedative use			0.053
Yes	22.3%	27.6%	
No	77.7%	72.4%	

The unit medical director instructs the nurse manager that he is going to start ordering that all his patients must be ambulatory by day 3 to prevent delirium. He cites the study above stating that the study found a statistically significant difference in early ambulation and delirium.

Based only on the information provided above, what can you conclude regarding:

Discussion 1a:
How many patients were involved?
Answer:

Discussion 1b:
How many patients had Delirium?
Answer:

Discussion 1c:
How many patients did not have Delirium?
Answer:

Discussion 1d:
For which variables were patients in the Delirium Group **SIMILAR**
to patients in the No-Delirium Group?
Answer:

Discussion 1d:
For which variables were patients in the Delirium Group **SIGNIFICANTLY DIFFERENT**
to patients in the No-Delirium Group?
Answer:

Digging deeper (methods):

This a link to a short (6-min) youtube video on types of data. Watch this video before you continue.
http://www.youtube.com/watch?v=hZxnzfnt5v8

The physician later sent an email to all of the nurses and he included a copy of the manuscript. The nurses are reading the manuscript when they come across the following paragraph in the methods section of the manuscript.

> "Data was abstracted directly from the electronic medical record. Ambulatory day was defined as the date-of-ambulation minus admission-date. The mean number of IVs was defined as the number of IV solutions infusing each day divided by the number of hospital days. Narcotic use was defined as the number of patients who received at least one narcotic drug during their hospitalization. Sedative use was defined as the number of patients who received at least one sedative medication during their hospitalization."

Discussion 2a:

Which of the following variables are typically 'Nominal' type of data?

- Age (in years)
- Sex (male or female)
- Delirium present (yes or no)
- Hospital days (number of days)
- Mean number of IVs (number of IVs)
- Narcotic Use (yes or no)
- Sedative Use (yes or no)

Answer:

Discussion 2b:

How could the variable "sedative use" be converted into an interval type variable

Answer:

Digging deeper (Results):

The physician has highlighted some of the sentences in the results section. The first sentence is below:

Sentence 1.
"The number of IVs in the delirium group versus non-delirium group were summarized and reported as quality improvement data to hospital administration ($\bar{X}_1$ = 1.9, S.D. = 1.0; $\bar{X}_2$ = 1.8, S.D. = 0.81; p=0.21)."

➤ The physician Interpretation is that the mean number of IV's is actually higher in the delirium group because the standard deviation is 1.0 which is a perfect correlation.

Discussion 3a:
Which of the following terms describes the spread of the data
"mean" or "standard deviation" ?
Answer:

For Discussion 3b assume the following two sets of data (each with 8 observations)

Set	Obs1	Obs2	Obs 3	Obs4	Obs5	Obs6	Obs7	Obs8	Mean
Control	10	8	9	10	8	9	10	8	9
Intervention	2	4	6	8	10	12	14	16	9

Discussion 3b:
Based on the table above, which group would be expected to have a higher standard deviation (more spread out data)?
Answer:

Discussion 3c:
What is the mean number of IVs in the delirium group?
Answer:

Discussion 3d:
What is the mean number of IVs in the non-delirium group?
Answer:

Discussion 3e:
Which group (delirium or non-delirium) had a larger standard deviation?
Answer:

The physician has highlighted some of the sentences in the results section. The second sentence is:

Sentence 2.
"Analysis from Table 4 indicate that 595 (38.5%) of the patients without delirium were ambulatory by the end of day 3 compared to 69 (24.8%) patients. There was a significantly higher odds of being ambulatory on day 3 and delirium free (X^2 = 1.55; 95%CI=1.25-1.92)."

Table 4. Ambulatory Status and Delirium.

		Patient was Ambulatory by day 4		
		Yes	No	total
Did not have Delirium	Yes	595	951	1546
	No	69	209	278
	total	485	1339	1824

➢ The physician interpretation is that the Chi-Square indicates that there is a 55% increase in the odds of a patient who does not get out of bed by the end of day three developing delirium.

Discussion 4a:
What information does a Chi-Square test provide?
Answer:

Discussion 4b:
What is the Chi-Square value that the physician refers to in his interpretation?

Answer:

Discussion 4c:
Describe the confidence interval for the Chi-Square value.
Answer:

Coming to consensus

One of the nurses summarizes the manuscript by making the following statement:

"Early ambulation is associated with a lower odds of experiencing delirium. But, from these data, we don't really know the direction of this relationship."

Discussion 5a:
In the first statement, what does the nurse mean by "the direction"?

Answer:

Discussion 5b:
Is the nurse correct in her interpretation?
Answer:

Another nurse makes the following statement based on the results from Table 1.
"It looks to me like patients who got more sedation had less delirium. I think that shows that we need to be more vigilant with sedating patients when they need it."

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Discussion 5c:
What is the p value associated with this relationship?
Answer:

Discussion 5d:
Is the second nurse correct in stating that patients with no evidence of delirium got more sedation?
Answer:

Discussion 5e:
Is the second nurse correct in her interpretation that more sedation is associated with less delirium?
Answer: