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# Statistical Analysis of the Workload on the LVHN Observation Unit

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## Background

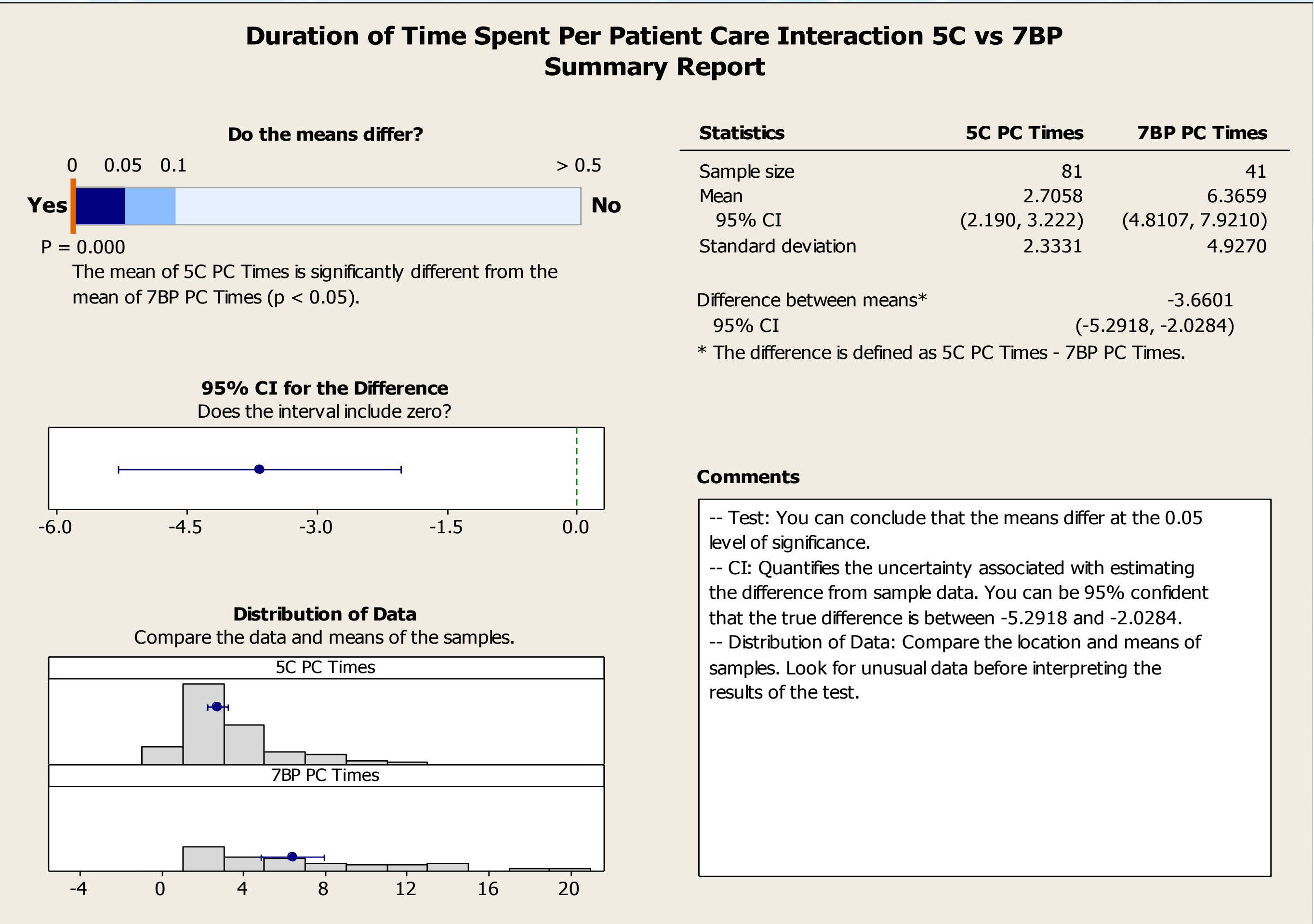
The LVHN Observation Unit (OU) is an extension of the LVHN Emergency Department (ED) and Hospital Medicine Service. This OU is where patients are sent after ED admission if they are not sick enough to require an inpatient admission, but still require medical attention before they can be discharged [1]. These patients rarely have life threatening symptoms, but are more likely to struggle with pain or discomfort [1]. It is believed that the OU patients require more work from nurses because the nurses have 48 hours to complete work that nurses in other units have 96 hours to spread out.

The OU staff believes that they should be responsible for fewer patients per nurse than other Med/Surg unit nurses are responsible for. However, OU nurses are currently responsible for 6-8 patients, while Med/Surg unit nurses are responsible for 5-6 patients [2]. In the opinion of the OU staff, 4-5 patients per nurse is an appropriate patient-nurse ratio for the OU [2].

## Methodology

Twelve hours of observation were conducted on both the Observation Unit (5C) and a comparable Medical-Surgery Unit (7BP). A set of typical tasks and procedures were identified in order to differentiate between medical value added to a patient and other occupational tasks required of the nurses.

Along with the process identifier, the start and end time of each process, and the room number of the patient involved was recorded. The observed nurses were chosen simply through assignment by the present Charge Nurse of the unit. These observations were performed on 6 nurses in the 5C unit and 4 nurses in the 7BP unit, totaling 24 observed hours and 692 observed processes on 57 patients. The data was then manipulated in many ways in order to run two-sample t-tests through Minitab, a statistical analysis software. This two-sample t-test was chosen because it highlighted the differences between the 7BP and 5C data sets.



## Results

In the 10 different observation periods on the 5C and 7BP, the 5C operated on average at a 6:1 patient-nurse ratio, comparing to the 7BP at a 5.25:1 patient-nurse ratio. 20 different t-tests were conducted, providing metrics such as mean, standard deviation, sample size, and p-values of the two data sets. The results are as follows:

Comparison	Stat	5C	7BP	Difference/p-value		SS	6	4	
1) Time spent between tasks	SS	402	214	No	11) Percent of observation period spent on paper work	Mean	2.47 3%	0.713%	Yes
	Mean	0.24 876	0.24299			STDV	1.14 1%	0.744%	0.021
	STDV	0.84 323	1.137						
2) Percent of observation period spent on one patient's care	SS	36	21	Yes	12) Percent of observation period spent on phone	SS	6	4	No
	Mean	11.3 25%	15.539%			Mean	7.10 8%	2.280%	
	STDV	7.34 3%	7.034%			STDV	8.18 2%	2.615%	
3) Duration of time spent per patient care interaction	SS	81	41	Yes	13) Amount of medicine checks per patient	SS	36	21	No
	Mean	2.70 58	6.3659			Mean	0.05 556	0.04762	
	STDV	2.33 31	4.927			STDV	0.23 231	0.21822	
4) Duration of time spent per computer work	SS	154	101	Yes	14) Amount of computer work instances per patient	SS	36	21	No
	Mean	1.18 05	1.83			Mean	4.27 780	4.80950	
	STDV	1.11 11	1.8651			STDV	3.37 730	2.71330	
5) Duration of time spent per idle period	SS	34	16	No	15) Amount of consults per patient	SS	36	21	Yes
	Mean	2.50 98	3.1771			Mean	0.50 000	1.33333	
	STDV	2.15 4	2.8031			STDV	0.77 460	1.15470	
6) Duration of time spent per nurse consult	SS	36	36	Yes	16) Amount of patient care instances per patient	SS	36	21	No
	Mean	1.44 44	2.8333			Mean	2.22 222	2.05000	
	STDV	1.29 16	1.9011			STDV	1.86 870	1.60510	
7) Percent of observation spent on computer work	SS	6	4	No	17) Amount of paper work instances per patient	SS	36	21	Yes
	Mean	24.6 13%	25.642%			Mean	0.47 222	0.14286	
	STDV	6.86 0%	6.625%			STDV	0.77 408	0.35857	
8) Percent of observation spent on Patient Care	SS	6	4	No	18) Amount of supply retrieval instances per patient	SS	36	21	No
	Mean	29.4 27%	36.012%			Mean	0.66 667	0.42857	
	STDV	11.2 08%	16.401%			STDV	0.98 561	0.74642	
9) Percent of observation period spent on consult	SS	6	4	No	19) Amount of phone calls per patient	SS	36	21	No
	Mean	11.1 70%	18.438%			Mean	0.22 222	0.04762	
	STDV	5.60 3%	8.414%			STDV	0.48 469	0.21822	
10) Percent of observation spent on Supplies	SS	6	4	Yes	20) Amount of beep responses per patient	SS	36	21	No
	Mean	7.57 8%	2.608%			Mean	0.11 111	0.19048	
	STDV	3.40 7%	2.107%			STDV	0.52 251	0.40237	

Table of results of 20 t-tests. SS=Sample Size. STDV= Standard Deviation. The difference column signifies whether or not the tests showed a conclusive statistical difference between the 5C and the 7BP in the given metric. Note: Numbered comparisons correspond to numbered list in conclusion section.

## Conclusion

- The following can be summarized in regards to the workload on nurses in both units:
- Both units spend approximately the same amount of idle time in between processes.
  - Nurses in the 7BP unit spend a higher percentage of shift time on direct patient care of any given patient than do nurses in the 5C unit.
  - Individual periods of direct patient care in the 7BP unit take more time to conduct than they do in the 5C unit.
  - Individual periods of computer work in the 7BP unit take more time to conduct than they do in the 5C unit.
  - Individual idle periods in the 7BP unit are lengthier than they are in the 5C unit.
  - Individual periods of nurse consultation in the 7BP unit take more time to conduct than they do in the 5C unit.
  - Both units spend approximately the same percentage of shift time on computer work.
  - Nurses in the 7BP unit spend a higher percentage of shift time on direct patient care than do nurses in the 5C unit.
  - Nurses in the 7BP unit spend a higher percentage of shift time consulting either a doctor, nurse, patient's family member, or other employee than do nurses in the 5C unit.
  - Nurses in the 5C unit spend a higher percentage of shift time gathering supplies for a patient than do nurses in the 7BP unit.
  - Nurses in the 5C unit spend a higher percentage of shift time completing patient paper work than do nurses in the 7BP unit.
  - Nurses in the 5C unit spend a higher percentage of shift time on their work cell phone than do nurses in the 7BP unit.
  - Nurses in both units delivered or checked any given patient's medicine approximately as frequently as each other. This process in itself was performed rarely in both units.
  - Nurses in both units completed any given patient's computer work approximately as frequently as each other.
  - Nurses in the 7BP unit consulted either a doctor, nurse, patient's family member, or other employee in regards to any given patient more frequently than did nurses in the 5C unit.
  - Nurses in both units conducted direct patient care on any given patient approximately as frequently as each other.
  - Nurses in the 5C unit completed any given patient's paper work more frequently than did nurses in the 7BP unit. This process in itself was performed rarely in both units.
  - Nurses in the 5C unit retrieved supplies for any given patient more frequently than did nurses in the 7BP unit.
  - Nurses in the 5C unit completed more phone calls for any given patient more frequently than did nurses in the 7BP unit.

The two units share a very similar workload, although the work was completed in different fashions. The general trend of the two units' work flows are which the 5C unit's nurses conduct many short tasks more frequently, while the 7BP unit's nurses conduct longer, less frequent tasks. This is supported by the evidence that each floor was observed for 12 hours, but 437 processes were observed in the 5C unit, while only 250 processes were observed in the latter. However, the average process in the 5C unit only lasted 1.65 minutes while the average process in the 7BP unit lasted 2.88 minutes.

**For these reasons, it can be concluded that the patient-nurse ratios in the two units should be equivalent. It is recommended that the 5C OU operate at a 5:1 patient-nurse ratio.**

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