**Should You Go to a Bustling/High Volume ER or a Quiet One?**

Jolene Branch

Bellevue University

DSC 530: Exploratory Data Analysis

Matthew Metzger

February 29, 2020

# Abstract

Treatment timeliness in emergency situations is monitored thoroughly in health care facilities, yet the public tends to focus on treatment outcomes without regard for the timeliness that contributes to them. I used the publicly available ‘Timely and Effective Care – Hospital’ dataset, which contains required reporting elements from all U.S. hospitals and ERs that receive Medicare reimbursement, to look for differences among ERs of different volume in treatment times of interventions well known to contribute to clinical outcomes. The initial question is “Should you go to a quiet ER instead of a busier one in order to get faster care?” My hypothesis is low volume ERs perform initial diagnostic testing quicker than high volume ERs. Findings suggest that the low volume ER is faster at getting the initial ECG (electrocardiogram), but the difference in mean times is very small. Furthermore, it is the subsequent activities, such administration of ‘clot busting’ medications for stroke, or transfer out for surgical intervention, that will have the greatest effect on survival anyway. My conclusion (which is not to be construed as medical advice) is that if you don’t think you are having a heart attack or a stroke AND the small volume ER’s parking lot is empty, stop there. Otherwise go to a larger facility.

*Keywords:* ER, ED, chest pain, stroke

# Outcome of Exploratory Data Analysis

Sometimes non-intuitive observations in one aspect of life cause us to unknowingly create heuristics. The problem with heuristics is that if you are not aware you are using them, you may apply them inappropriately to tangential decisions. Having driven by a busy urgent care many times because I knew my child would be seen at a smaller urgent care 20 minutes further away, I wondered if the same phenomena would prove true in an emergency situation. There are 4586 unique facilities in the ‘Timely and Effective Care – Hospital’ dataset. Each facility has up to 19 measures reported. The data was last updated October 30,2019. Since not all facilities offer all services, there are many 'N/A's in the dataset. The histogram of clot busters within 30 minutes provided no insight, but a simple groupby() of the means of the ERs by volume hinted that the answer to the initial question would not be straight forward. The very high-volume ERs did best at the clot buster metric, but the high-volume ERs did the worst. Low- and medium-volume ERs fell in the middle. The same phenomena were not seen in the head CT results metric. All ERs, regardless of volume, do well at performing the ECG within 10 minutes of initial presentation for chest pain.

**Elements Missing from Exploratory Data Analysis**

Ideally, the data would have been further subsetted by the specialty resources available at the ER and associated medical center. Otherwise, ER facilities that are physically connected to a hospital that can provide the desired treatment skew the results of the ‘time to transfer out’ data as well as the ‘time spent in ER before leaving from visit’ data.

**What Was Missed During the Analysis**

I was not able to directly compare the variables that were presented as median time in minutes to perform treatment to those that used facility mean compliance rate (which was available as a percentage). I’m sure there is a way to do this, but felt that even if I was successful in performing the comparisons, that it would introduce even more potential for error in my analysis.

**Variables Not Present**

Another heuristic that I believe people apply to their ER location decision making is that of overall reputation of the facility A proxy variable for this (which is not available within this dataset) would be percent of patients treated who have insurance (verses private pay, charity care or Medicaid).

**Challenging Assumptions**

I assumed that any difference in performance would be sorted in order, either ascending or descending, of ER volume. I did not find this, and have no additional hypothesis on the matter, based on this data set.

**Challenges and Unknowns**

I thought that comfort level with the data and measurements would translate to easier analysis. However, this data set was not tidy and required cleaning and wrangling actions of which I had minimal prior exposure. Attempts to remove three outliers from one the ‘time to ECG’ variable resulted in loss of two thousand rows of data! That led me to seek evidence to support the conclusion that their presence really wasn’t hurting anything anyway! I still do not fully understand how to get the legend into the thinkstats2 PMF and CDF charts, and how Downey’s MakeFrames() function works. The only remaining question I have that could be of legitimate medical significance is prompted by the boxplot that I used to search for outliers in clot buster medication administration timeliness; “Why are the high volume ERs the best at making the 30 goal, but the very high volume ERs are the worst?”

# References

Bendary, A., Tawfik, W., Mahrous, M., & Salem, M. (2017, December 30). Fibrinolytic therapy in patients with ST-segment elevation myocardial infarction: Accelerated versus standard Streptokinase infusion regimen. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5787333/>

Mazurek Melnyk, B. (2018, October 26). Why Choose Evidence-based Practice? Retrieved from <https://www.aanp.org/news-feed/why-choose-evidence-based-practice>

Padgett-Powers, M. (2017, December 7). What You Should Know Before Heading to the ER. Retrieved from <https://thewell.northwell.edu/well-informed/what-you-should-know-heading-er>

Tong, Xin, et al. “A Decade of Improvement in Door-to-Needle Time Among Acute Ischemic Stroke Patients, 2008 to 2017.” *Circulation: Cardiovascular Quality and Outcomes*, vol. 11, no. 12, 17 Dec. 2018, doi:10.1161/circoutcomes.118.004981.