Top Hospital for Heart Failure Treatment

Xinrong Correia, Thao Nghiem, Xinyan Li

IT 370 Introduction to Analytics

University of Massachusetts - Boston

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Dear Prof. Du,

Our group's final project is to use Tableau to analyze the hospital's quality of care for heart failure patients. We are using released data from the public for US hospitals in 2014. We're doing this project because we want people with potential heart problems to have an intuitive judgment for hospitals in the United States, and we're trying to help patients get better treatment conditions based on strong data support proof.

Our aim is to show the audience how good hospitals in the US care for their heart failure patients competently. We have eight visual datasets to show the audience our results. We hope that viewing our projects provides you with a great visualization experience.

Sincerely,

Xinrong Correia, Thao Nghiem, Xinyan Li

What is the hospital's quality of care for heart failure patients?

In this project, we have eight datasets to analyze hospitals' quality and how they treat their heart failure patients. Before we go further, here is the description of the data set below.

Column Name	Description
Hos_ID	A unique ID for each hospital. It is the provider number assigned by CMS to each hospital.
Name	The name of a hospital
Address	The street address of a hospital
City	The name of the city where a hospital locates
State	The two-letter abbreviation of the state where a hospital locates
Zip_code	The zip code of a hospital
County	The name of the county where a hospital locates
Hos_Type	The type of a hospital, including four types: • A (Acute care hospital) • C (Children's hospital) • CA (Critical Access hospital) • V (Veterans hospital)
Ownership	The ownership type of a hospital, including • GF (Government –Federal) • GH (Government – Hospital District or Authority) • GS (Government – State) • GL (Government – Local) • FP (Proprietary, for-profit) • NPC (Non-profit – Church)
	• NPP (Non-profit – Private) • NPO (Non-profit – Other) • P (Physician-owned) • T (Tribal)
EMS	Whether a hospital provides emergence services or not, including • Yes • No
HF_count	The number of heart failure patients treated annually in a hospital
Re_admin	the 30-day re-admission rate for heart failure patients treated in a hospital, measured as the percentage of heart failure patients discharged from a hospital who are re-admitted to hospitals in 30 days
Mortality	the 30-day mortality rate for heart failure patients treated in a hospital, measured as the percentage of heart failure patients discharged from a hospital who die in 30 days
HF_Proc_1	process-of-care quality indicator, measured as the percentage of heart failure patients who are given proper discharge instructions in the hospital
HF_Proc_2	process-of-care quality indicator, measured as the percentage of heart failure patients who are given an evaluation of left ventricular systolic (LVS) function in the hospital
HF_Proc_3	process-of-care quality indicator, measured as the percentage of heart failure patients who are given ACE inhibitor or ARB for left ventricular systolic dysfunction (LVSD) in the hospital

Before we step into detail analyzing the dataset, we cleaned the data first and made a table that we can clearly see heart failure rate by state (table 1). We cleaned the data and got rid of the null value. In this dataset, we summarized the number of heart failure patients treated annually in a hospital, the 30-day readmission and mortality rate for heart failure patients treated in a hospital, and the process-of-care quality indicator, measured as the percentage of heart failure patients who are given proper discharge, evaluation of left ventricular systolic (LVS) and ACE inhibitor or ARB for left ventricular systolic dysfunction (LVSD) instructions in the hospital. This is the procedure we did below:

1. Changed type of the dataset because the numbers were stored as text in the dataset.
2. Then we went to the Data tab and clicked the text to columns to change the type of it. For the rest of the dataset, we did the same. Finally, we connect the excel file to Tableau.

HF Summary by States (Table 1)

State	HF count	Avg. HF Proc 1	Avg. HF Proc 2	Avg. HF Proc 3	Avg. Mortality	Avg. Re admin
AK	1,213	88	97	99	13	23
AL	23,349	87	94	94	12	23
AR	16,680	90	91	94	13	24
AS						
AZ	15,260	89	98	97	12	23
CA	81,008	93	98	97	11	23
CO	8,707	88	95	97	12	22
CT	16,803	92	99	95	12	23
DC	3,541	87	98	95	10	25
DE	4,881	97	100	98	11	21
FL	92,365	95	98	98	11	23
GA	33,643	92	96	97	12	23
GU	163	95	95	85	12	23
HI	1,982	93	99	96	12	22
IA	14,823	90	92	96	12	22
ID	3,098	88	86	99	13	22
IL	67,645	93	97	97	11	24
IN	35,820	91	96	96	12	23
KS	12,583	86	85	93	12	23
KY	27,553	91	93	91	12	24
LA	23,669	90	92	94	12	24
MA	33,375	94	99	95	11	24
MD	25,496	94	99	97	11	24
ME	7,155	97	100	97	12	23
MI	51,966	92	98	96	11	23
MN	13,439	84	91	95	12	23
MO	31,335	88	95	95	12	23
MP	17					
MS	18,431	81	89	93	12	24
MT	3,498	92	93	98	12	22
NC	42,972	95	99	97	12	23
ND	4,079	89	83	96	12	22
NE	8,220	86	91	98	12	22
NH	5,685	96	98	97	12	23
NJ	50,287	97	99	98	11	24
NM	4,347	85	90	97	12	22
NV	6,209	88	92	97	12	24
NY	70,207	94	98	95	11	24
OH	52,870	94	98	97	11	23
OK	17,456	87	87	92	12	23
OR	8,615	89	95	96	13	22
PA	62,120	93	99	95	11	23
PR	3,106	85	94	90	12	24
RI	4,475	93	99	94	12	24
SC	20,257	94	97	97	12	23
SD	3,914	93	94	92	12	23
TN	33,007	91	95	95	12	24
TX	86,543	91	95	96	12	23
UT	3,871	94	97	99	13	21
VA	33,808	94	98	98	12	23
VI	212	98	98	90	12	23
VT	2,532	91	99	95	13	22
WA	17,963	91	97	97	13	22
WI	21,558	93	96	96	12	22
WV	11,041	91	96	97	12	24
WY	1,789	83	93	96	13	23

I. Find out the best state in treating heart failure by using Mortality and Re-admission rate.

Procedures:

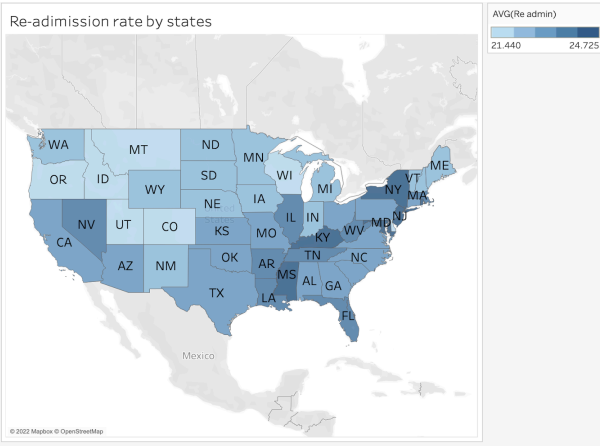
1. We chose to exclude the null value in mortality because it doesn't affect the analysis results.

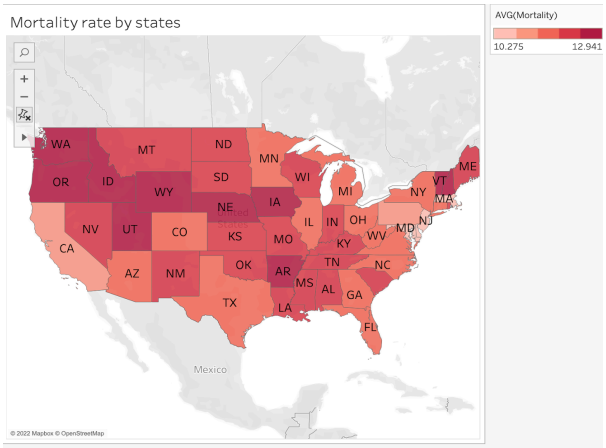
2. Drag the state to the sheet, and filter it by name(Non-mainland states (GU, HI, AS, PR, AK, and so on) were excluded because their differences in population may have an impact on the outcome of determining which state has the best hospitals).

3. Drag Re admin and change from Sum to avg, because the datasets show percentage, so we use Avg.

4. Marks the re-admin by color.

5. Do the same with Mortality





We started by looking for the best hospitals in states, so we filtered by states' names, changed the sum re-admin to avg, and did the mortality and country in the same way. We can clearly see that the darker the color, the higher the rate. So NJ has the highest Readmission rates but the lowest in the Mortality rate. AR has the highest Mortality rate and MA has the lowest Mortality rate in all of the states. Because each state has a different population and because of the hospital's fluidity, we can't tell which is the best hospital so far based on this data analysis.

II. Effectiveness by hospital types

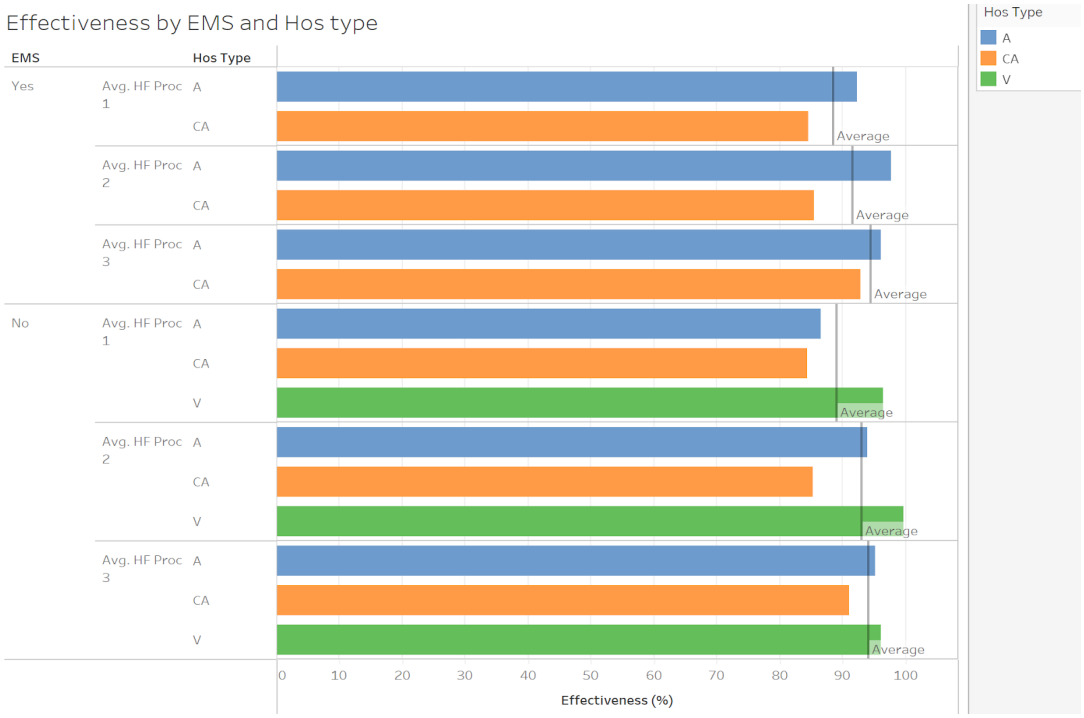
In this part, we summarized all of the hospital types, so that the audience could see which types of hospitals received the most heart failure patients. From that decide their heart failure treatment locations. Here, we analyze the differences in their effectiveness in treating heart failure patients. We exclude null values because no patients at Children's Hospital are treated for failure in this step.

HF Summary by Hos Types

Hos Type	HF count	Avg. HF Proc 1	Avg. HF Proc 2	Avg. HF Proc 3
A	1,154,030	92	98	96
C				
CA	54,920	85	86	93
V	37,691	96	100	96

(Table 2)

Table 2 shows there are no patients in children's hospitals. Meanwhile, most of the people went to Acute care hospitals, then Critical Access hospitals, and Veterans hospitals for treating heart failure.



(Graph 1)

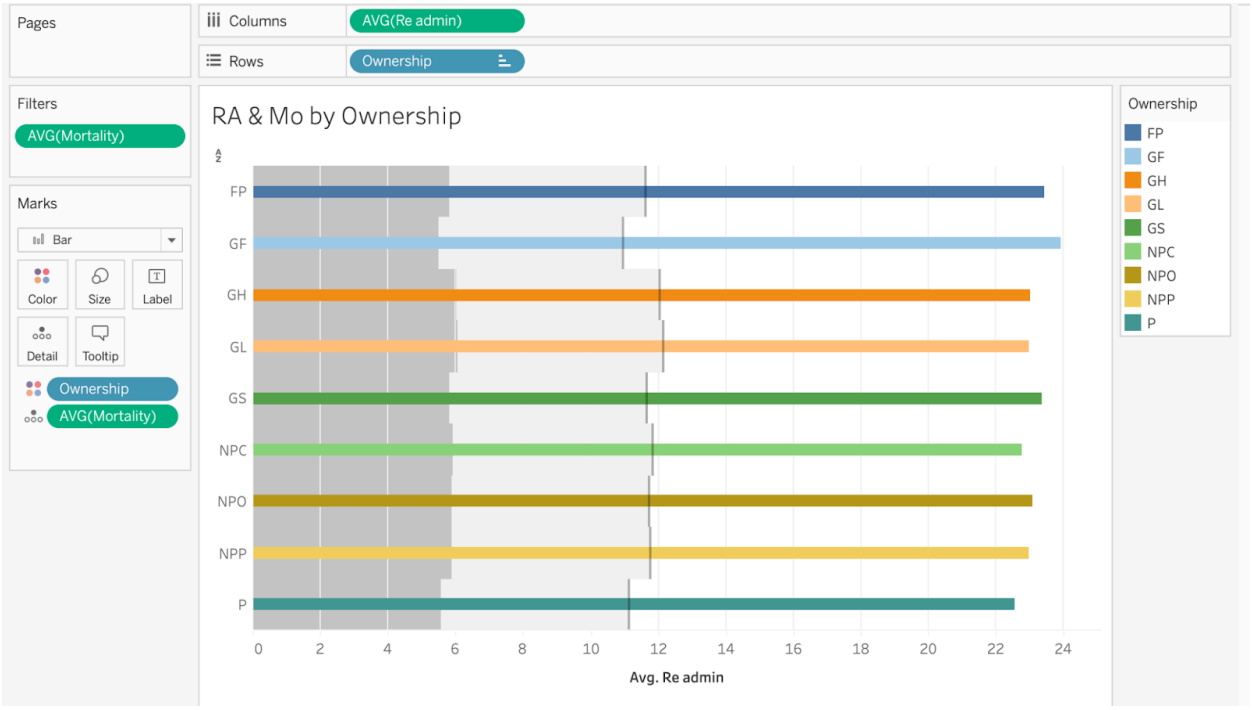
In graph 1, the most effective treatment process is process-of-care 3 with an average rate is 94.42. The lowest effective treatment is process-of-care 1, the average rate is 92.36. As we can see from graph 1, people are going to treat heart failure in an emergency hospital more than going to the hospital without an emergency hospital, and we also can clearly see that it doesn't matter that the children's hospital has no patients for heart failure.

III. Effectiveness of hospital having emergency service and the hospital does not have emergency service.

In this part, we aim to answer the question of whether having emergency services or not changes a hospital's effectiveness in treating heart failure patients. As shown in graph 1, the quantity remains unchanged when the hospital does not provide emergency services. The process-of-care 1 is still the lowest and the process-of-care is the highest. At the same time, the green line which represents Veteran hospital type doesn't have emergency service. However, they have the highest rating for the three types of heart failure treatments and the quantity still

remains the same. Meanwhile, the quality of Acute care hospitals and Critical Access hospitals is lower when they don't have emergency services.

IV. Outcomes by hospital ownership

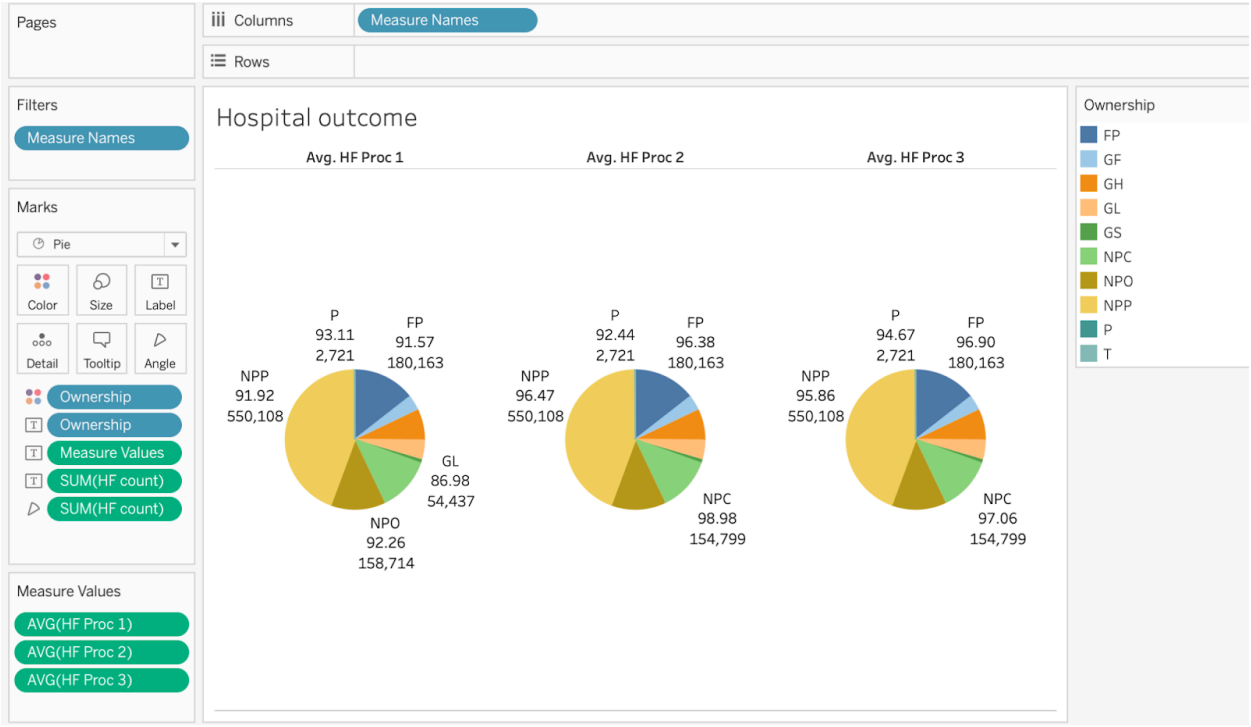


To see the outcome of care measures, we need to check the mortality rate and the readmission rate from each kind of hospital's ownership. From the screenshot above, we can see the mortality rates and the readmission rates of different ownerships are very close. The mortality rates fall within the range of 10.967 to 12.147. The readmission rates fall within the range of 22.554 to 23.916. In conclusion, the types of ownership are not associated with the outcome of care measures.

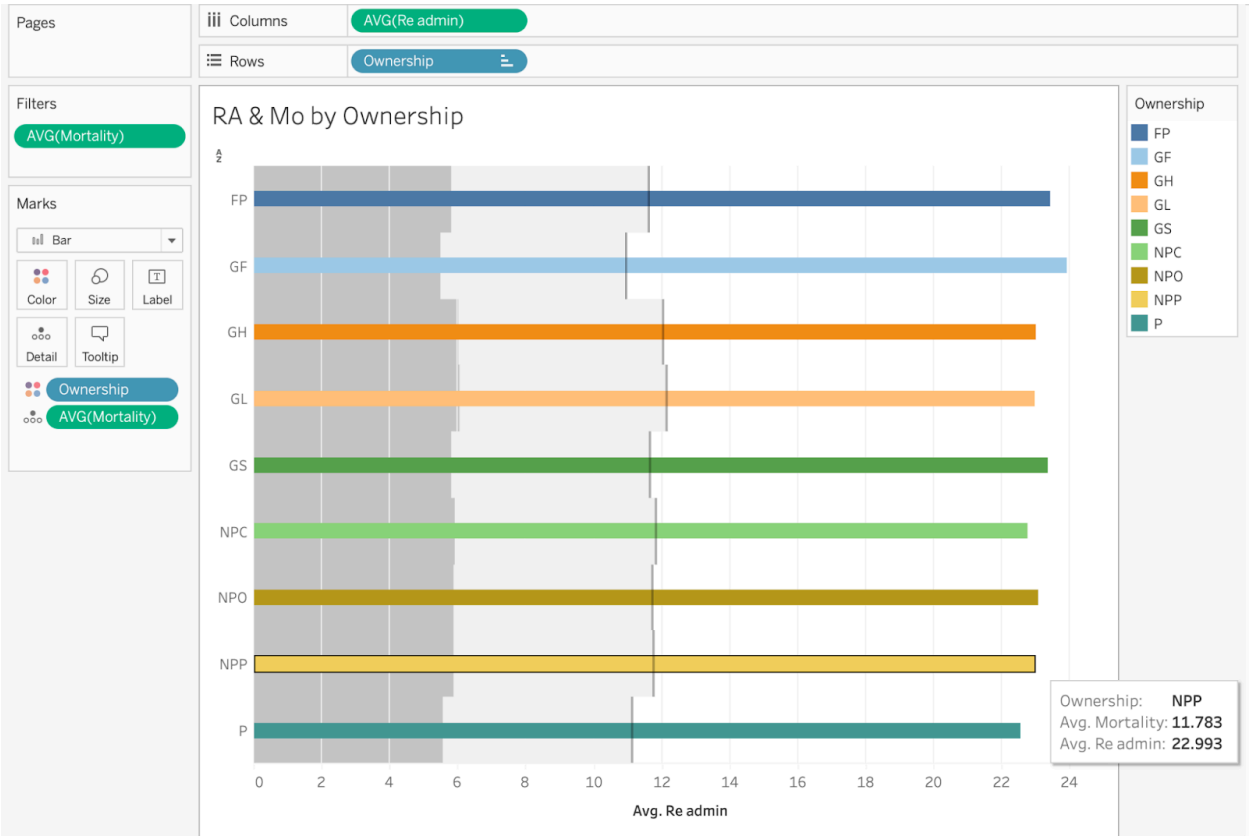
V. Relationship between hospital care's outcome and the number of patients treating heart failure

From the previous part, we can see that the hospitals perform averagely based on the outcomes of care measures. So, there's no difference in attracting more patients of heart failure for hospitals with outcome-of-care measures.

Regarding the process of care, we need to evaluate the statistics of HF_Proc_1, HF_Proc_2 and HF_Proc_3.

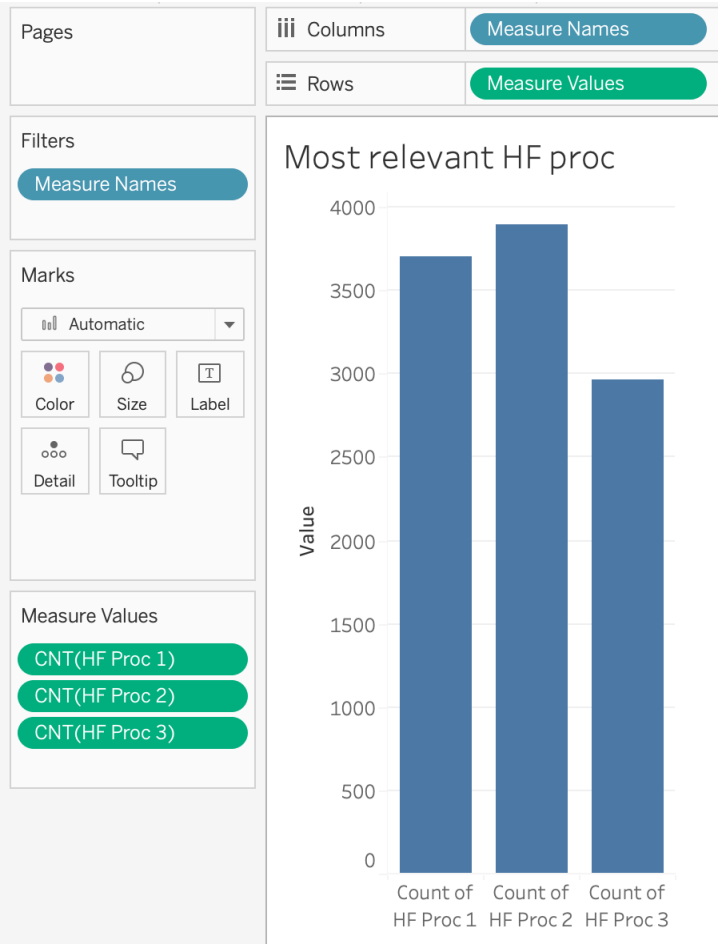


In the screenshot above, we can see NPP, this ownership has the largest sum of patients in 3 HF_Processes.



However, in this screenshot, NPP maintains a comparatively low rate of readmission and mortality, where the lowest readmission rate is 22.554 and the mortality rate is 10.967 shown in the previous question. Hence, the volume of patients does not affect the process of care provided in ownerships, either positively or negatively.

VI. The most relevant process-of-care



From the screenshot above, obviously, HF_Proc_1 and HF_Proc_2 are more relevant and important, which are 3704 and 3893 separately.

Conclusion

In this project, we analyzed lots of data about the heart failure treatments in different hospitals and ownerships of the states, and their treatment effectiveness.

We find out NJ has the highest readmission rate and MA has the lowest mortality rate of the states, which could be related to the local economy, dietary habits, living habits, medical levels, and residents' awareness of health education.

As for treatment measures, even though HF_Proc_1 and HF_Proc_2 are more relevant, the most effective treatment process is process-of-care 3 and the lowest effective treatment is process-of-care 1. And there's no difference in attracting more patients with heart failure for hospitals with outcome-of-care measures.

Besides, patients with heart failure prefer to go to hospitals with EMS. Also, the volume of patients does not affect the process of care provided in ownerships, either positively or negatively. And the types of ownership are not associated with the outcome of care measures.