



HMP 669

FINAL PROJECT REPORT

Mohammed Baseer (mbaseer)
Tony Lee (leetony)
Siri Rallabhandi (srallab)
Ashruti Tuteja (tashruti)

University of Michigan

HMP 669: Data Management in Healthcare

Dr. Rahul Ladhania



Executive Summary

From the data provided, we found that Omega Hospital provides services to a total of 16,745 patients in all departments. From this patient population, approximately 4,506 or 27% patients receive either cardiac or orthopedic services. Due to such a high volume of patients being treated at Omega in their cardiac and orthopedic divisions, it is necessary to evaluate these departments' data before Eastern Health System enters into a contractual agreement with Omega Hospital and the physician groups.

Within this report, our team has analyzed Omega Hospital's historical data to drive out conclusions regarding contracting opportunities with both cardiac and orthopedic departments. Our assessment for this report is based on three major criteria:

- *Assessment of the Patient Population:* To assess the patient population and community needs, we identified key demographics such as patient race, sex, distance from the Omega Hospital and length of stay,
- *Hospital Utilization:* These criteria helped us identify Omega Hospital's key quality metrics through analysis and visualization of their death rates, admission and discharge data, ICU/CCU information and physicians information.
- *Financial viability:* We identified profitability, payer mix, number of elective surgeries performed and Length of stay outlier rate as major financial factors for determining our final recommendation to Eastern Health System

This analysis allowed us to compare cardiac and orthopedic services with other departments and also provided an overview of all the advantages and disadvantages of contracting with Omega Hospital. With the historical data given to us, we were able to conclude that contracting with cardiac and orthopedic physician groups is overall beneficial to the Eastern Health System (EHS). Notable risk factors will be discussed, especially for cardiac services.

*Cardiac services may be indicated by the DRG code of "05" or the Physician Specialty code of "14" and orthopedic services by DRG code of "08" or Physician Specialty code of "58." All other services mentioned in key metrics may not be mentioned by name.

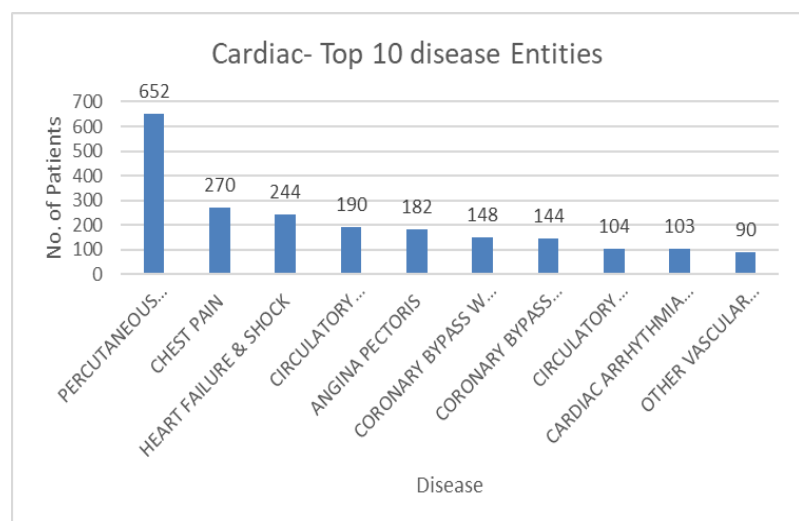
“Carve-Out” Contracts with Physician Groups and Insurers

A carve-out contract is a term which refers to an agreement between an insurer and the physician group wherein the physician group undertakes all the financial responsibilities and management services of a particular service which are not included in the standard health insurance contract ([TalentLyft](#)). A carve-out contract must be defined clearly as any differences can lead to serious financial implications. For instance, there are additional costs for certain types of patients and services and carve-out contracts should be negotiated to make sure to cover the additional and unforeseen costs. Other risks include prior negotiations for hospitals that are paid through MS-DRGs and separate payments such as administrative costs that are usually needed for emergency departments.

A potential benefit of establishing a carve-out contract is making sure physicians are providing services that align with the goals of the contract. As most insurance companies follow the value-based care model, they tend to reimburse based on how efficiently the service has been provided by the physicians.

Assessment of the Patient Population

Cardiac Care: The patient population for cardiac and orthopedic service groups at Omega were analyzed through DRG codes. The top disease entity for cardiac care is percutaneous cardiovascular procedures, which restore blood flow for clogged coronary arteries and are typically minimally invasive ([UCSF Health](#)). With over 650 patients who received these procedures, physicians alleviated patients’ symptoms of blocked arteries, such as chest pain or shortness of breath. Other highly coded disease entities

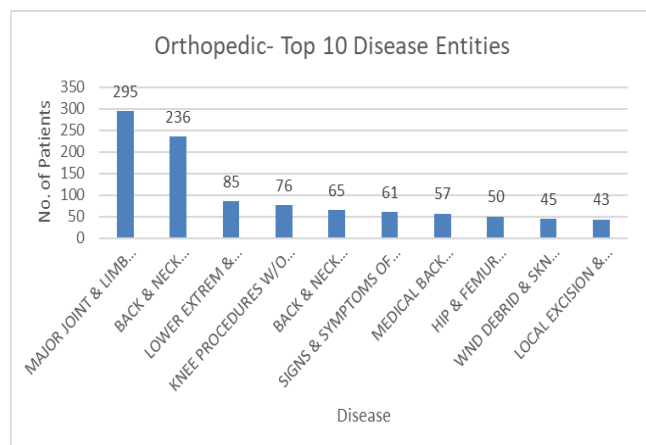


Approximately 3,020 patients were admitted in the cardiology service line. Cardiovascular diseases, despite advanced treatment and preventative care measures, are major causes of morbidity ([Zannad 2008](#)). Certain risk factors, such as obesity, age, and race can impact patient groups at higher rates. Research shows Black patients are more likely to suffer from cardiovascular diseases; for instance, in 2015-2016, non-Hispanic Black adults were most likely to have hypertension, obesity, and diabetes compared to other racial groups ([CDC](#)). Non-white patients have higher average length of stay at Omega than white patients, causing heightened risk for hospital-acquired conditions and increased costs ([Jia et al. 2019](#)).

Given Omega's patient data, it is clear that cardiovascular care is a necessity for its population's health. While it is beneficial to provide cardiology services to this patient population, EHS should work with Omega to develop community-based and preventative care programs to ensure decreases in cardiovascular cases and increase in overall patient health.

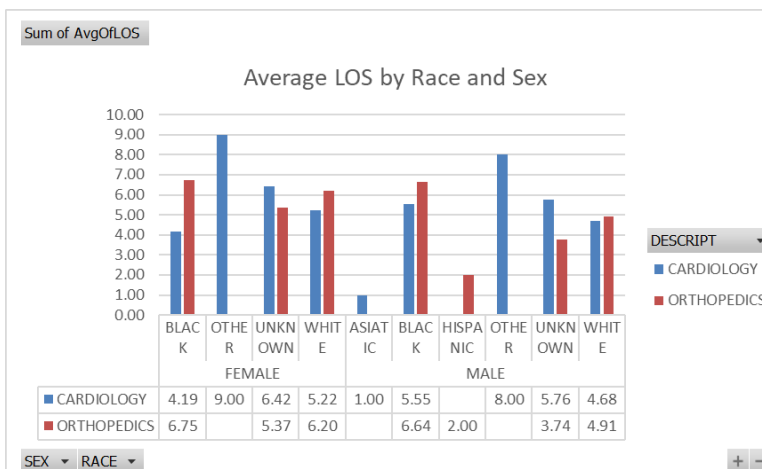
Orthopedic Care: This service line differs from cardiology in its number of patients and demographic breakdown. Orthopedics is highly specialized, and commonly relies on referral-based procedures. Omega's most common orthopedic DRG procedures are major joint and limb reattachment of lower extremities with 295 patients, and back and neck procedures with 236 patients.

The orthopedic service line is evidently less patient-intensive and may require fewer resources (supplies, physicians, operating rooms, inpatient rooms, etc). However, racial disparities exist in orthopedic services impacted by social determinants of health, including health literacy, education level, and socioeconomic status ([Shalchi 2020](#)). In Omega's data, we see Black individuals experiencing the longest length of stay at over 6 days for orthopedic procedures. Approximately 1,486 individuals were admitted in



this specialty department with 221 patients receiving elective procedures while only 33 had emergent procedures.

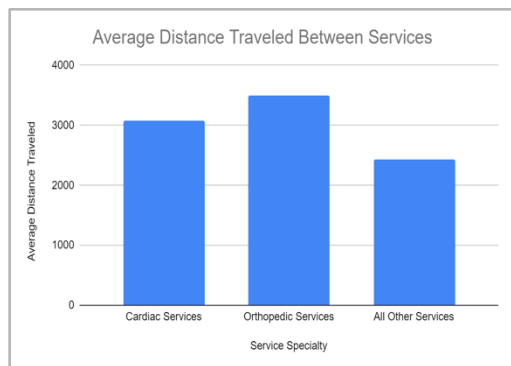
The large difference in patient count for elective versus emergent care highlights the opportunity to expand this specialty care to more patients with this possible joint venture with an orthopedic physician group. Recent findings even show positive trends of procedure utilization by Blacks



and Hispanics - two racial groups who experience the most health disparities ([Shalchi 2020](#)).
(Refer to Appendix A-C for more data)

Hospital Utilization

There are key performance indicators for the EHS Executive Committee to consider in accepting risk for Omega's Cardiac and Orthopedic services, such as brand and reputation, quality of care, resource utilization, and patient-physician relationships. Orthopedic patients must travel approximately 400 miles farther on average than cardiac and 1,000 miles farther than other care services. This may indicate that either patients visit other centers closer to their place of residence or travel farther to Omega to receive high-quality care.

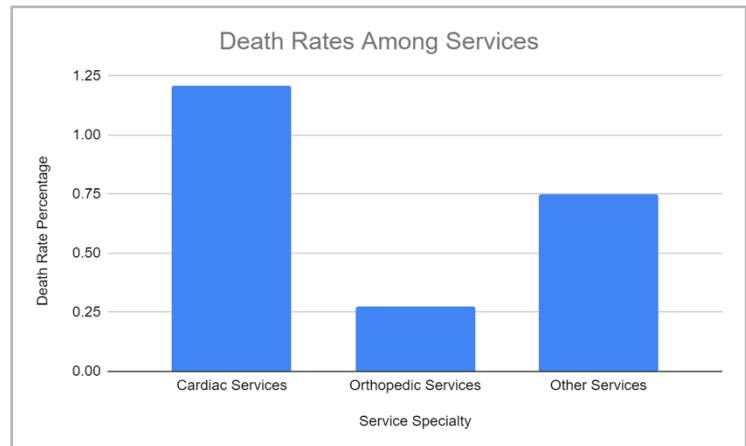


However, by analyzing mortality rates in the patient data, the death rate in orthopedics is 0.27% compared to 1.2% in cardiac care and 0.75% for all other services. This may correlate with the number of elective procedures for each service line. Although orthopedic physicians commonly

have patients with lower extremity conditions as mentioned above, the risk of mortality is much lower than cardiovascular diseases.

A key quality performance indicator is the percent of patient visits that may require an external review by an independent physician or hospital group

for the patient's health insurance company. Over 40% of external review decisions are in favor of the patient, in which health insurance payers must cover the service or treatment (Massachusetts Office of Patient Protection). With Orthopedic services having a lower percentage, this DRG group implies more risk with higher costs associated with not meeting quality measures and lower patient satisfaction.



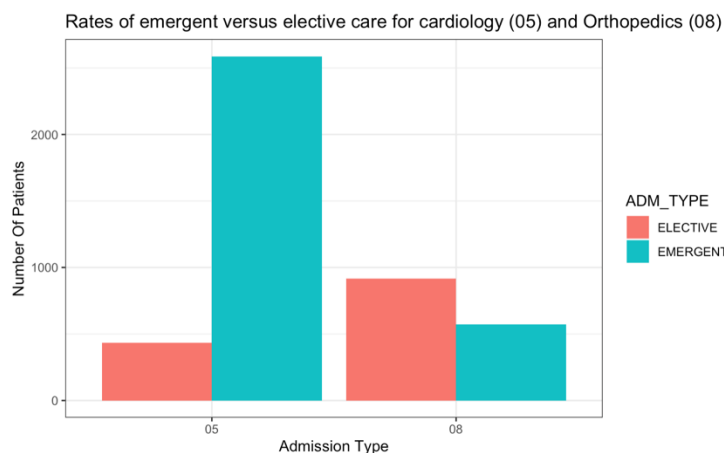
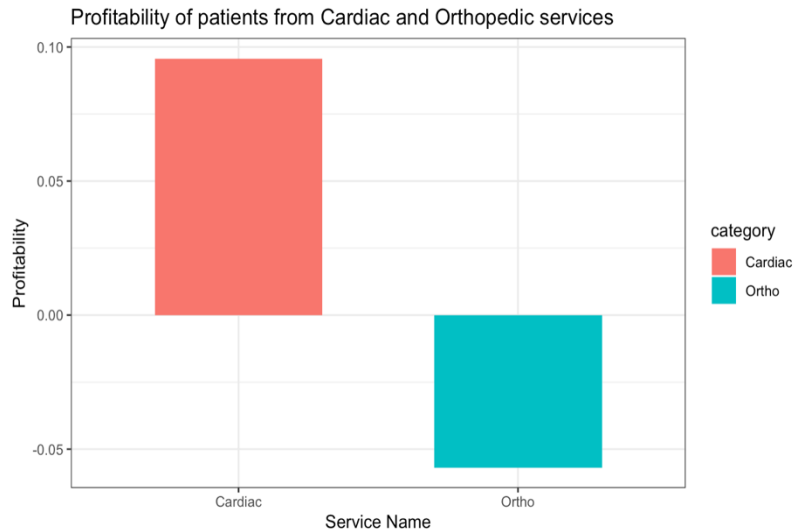
EHS should consider expanding orthopedic and cardiac services geographically to ensure equitable access to care for patients and reduce the distance traveled to receive high-quality care. The organization should consider resource utilization factors, especially inpatient and death rates which can substantially increase costs.

(Refer to Appendix D-E for more data)

Financial Viability

Lastly, key financial indicators were analyzed to help determine EHS's decision to sign risk contracts with Omega. Cardiac services had a positive profit margin at 0.09 while orthopedic services had negative margins.

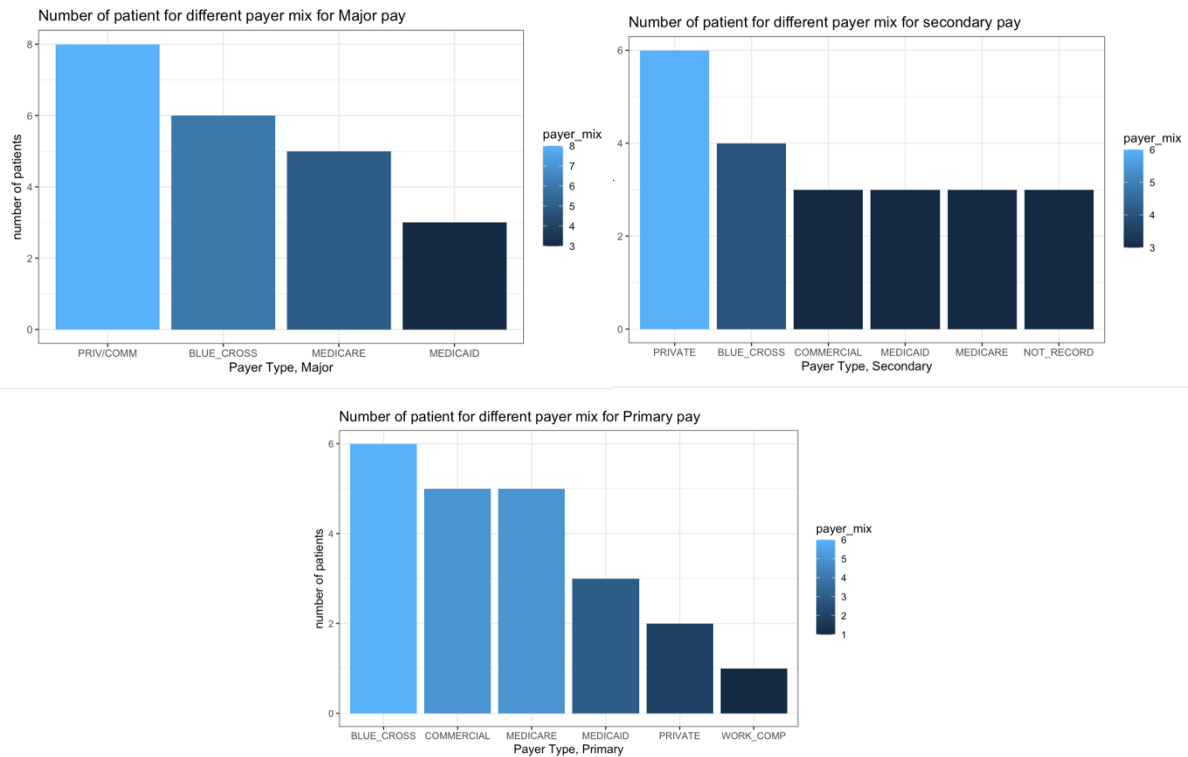
Decreased profitability in orthopedic services may be due a multitude of reasons: common orthopedic surgeries are moving to outpatient settings, the aging population are moving on Medicare and its lower reimbursement rates, or insurers are guiding patients to lower-priced providers ([Remis 2022](#)). On the other hand, cardiac services could be more profitable as insurers are more inclined to cover chronic diseases found in cardiovascular health especially with the elimination of the pre-existing conditions clause under the Affordable Care Act. Cardiac and orthopedic services had similar average length of stay for patients and associated outliers, which helps compare the two groups' profitability as well. (*Refer to Appendix F, for profitability of all services*)



Given patient demographics, Omega's cardiac services will be more utilized (especially given its prevalence of emergent procedures compared to orthopedics) which could lead to its higher profit margin. Research shows financially stable providers have a larger capacity to maintain health systems that highlight

quality care as well as providing high quality of care and patient satisfaction can lead to financial gains, such as increased profitability ([Jakóbczyk 2021](#)). This feedback loop should be considered during this discussion of financial measures.

Payer mix, or the percentage of patients insured with various health insurance coverages, is a key driver of Omega’s financial health, which can influence its quality of care and patient outcomes (Manary et al. 2015). Commercial, Medicare, and Blue Cross were Omega’s top three payers for patients. While this is unsurprising and similar to many hospitals and health systems, self-payers and private insurance companies compensate at higher rates than Medicare. Medicare and Medicaid historically reimburse hospitals less than the cost of patient services provided.



Recommendation

We recommend Eastern Health System should include Omega Hospital in current contract negotiations with both physician groups, Cardiac and Orthopedic. Orthopedic services are in strong standing in regards to its patient population, resource utilization, and death rate. The average length of stay is typically higher for both Cardiac and Orthopedic departments compared to the other departments; however, cardiac services bring in the most revenue for the Omega Hospital. Industry trends indicate cardiac services may bear higher risks, such as increased costs, reduction in quality of care, and decreased patient outcomes yet Omega’s cardiology department proves to

be more profitable than orthopedic services. EHS and Omega should proceed with caution in forming risk contracts for both groups and implement risk mitigation strategies to tackle financial and resource utilization issues.

Validity and Scope of Analysis

Limitations in Data

The first limitation is the original database had many patient gaps in which we needed to clean and filter. However, approximately 651 patients “lived” 65,535 miles away from Omega. It is highly unlikely that this is true, and therefore is a value inserted in the database to indicate there is no data available for these patients. Additionally, other information such as units for length of stay, distance traveled by patients was not reported clearly in the Omega_2000 dataset. Total number of patients that have utilized cardiac and ortho services were 4,506, however, when looked at some metrics individually all 4,506 patients were not seen. This means that either data was not reported properly or data is not available.

Assumptions

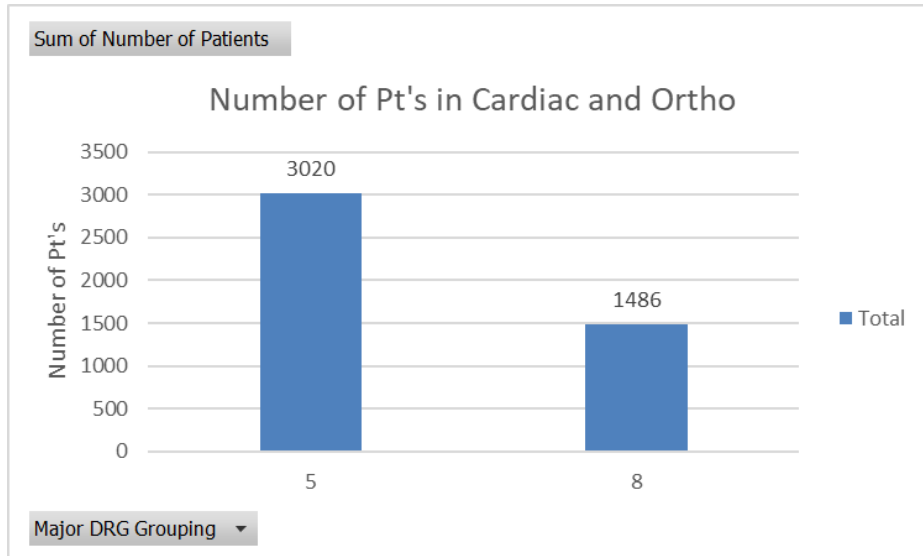
Cardiac and orthopedic services have been compared to all other services multiple times in our analysis rather than other highly specialized service lines at Omega. Other services can be a larger subset of the hospital’s patient population, impacting the statistical data provided.

Additional Data Necessary

Additional data that would be necessary to perform a full assessment of Omega are metrics that can show detailed financial accounts of Cardiac and Orthopedic departments. This will help in calculating the financial strengths and weaknesses while creating the contract. Financial statements such as balance sheets, income statements and cash flow statements of the past 10 years are necessary to understand the total assets and liabilities of Omega. There is also no patient socioeconomic status or income levels provided in the data, which are important social determinants of health that EHS and Omega should consider in whether investing in each or both DRG groups is profitable.

Appendix

A. Number of Patients in Cardiac and Ortho Services



B. Cardiac- Teaching Service and Payer Mix Tables

Count of 'PRIM_PAY'

Row Labels	Count of PRIM_PAY
MEDICARE	1649
BLUE_CROSS	730
COMMERCIAL	529
MEDICAID	86
PRIVATE	24
WORK_COMP	4
...	...

Count of 'TEACH_SVC'

Row Labels	Count of TEACH_SVC
NOT_TEACH	2734
TEACHING	288
Grand Total	3022

+ Insert PivotTable

Is this helpful?

C. Orthopedic- Teaching Service and Payer Mix Table

Count of 'PRIM_PAY'

Row Labels	Count of PRIM_PAY
MEDICARE	565
COMMERCIAL	398
BLUE_CROSS	332
WORK_COMP	134
MEDICAID	35
PRIVATE	24

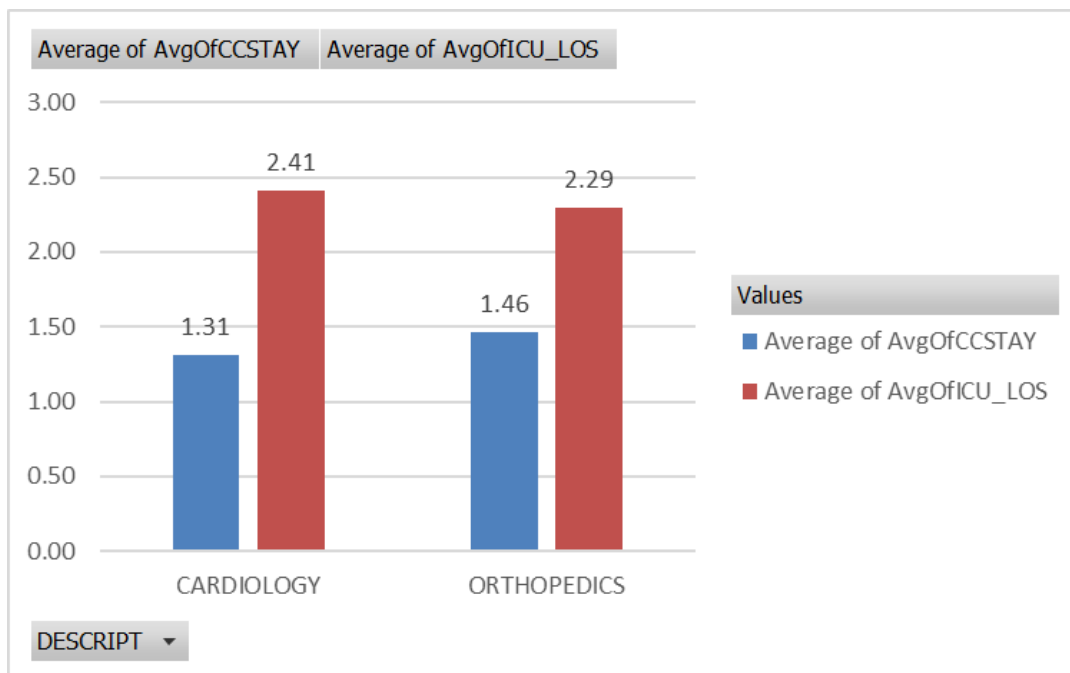
Count of 'TEACH_SVC'

Row Labels	Count of TEACH_SVC
NOT_TEACH	1426
TEACHING	62
Grand Total	1488

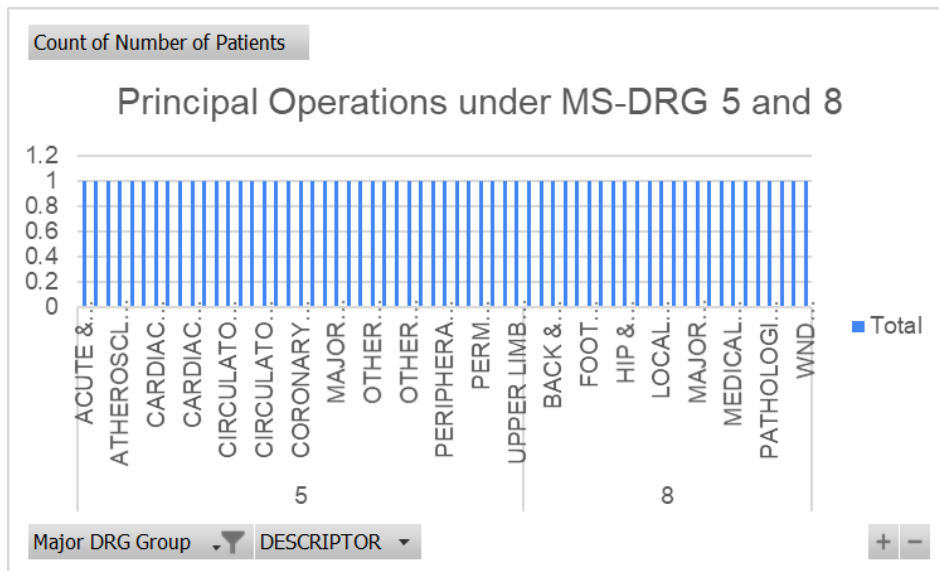
+ Insert PivotTable

Is this helpful?

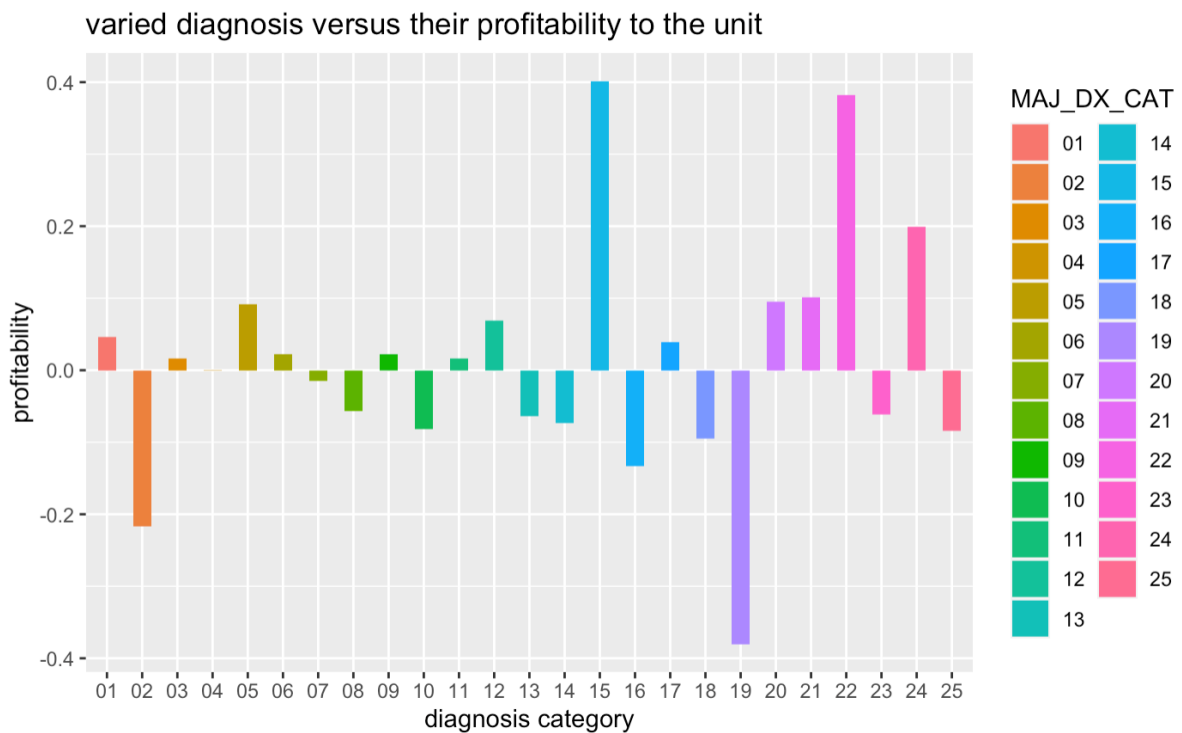
D. Average CCStay and Average of ICU- LOS



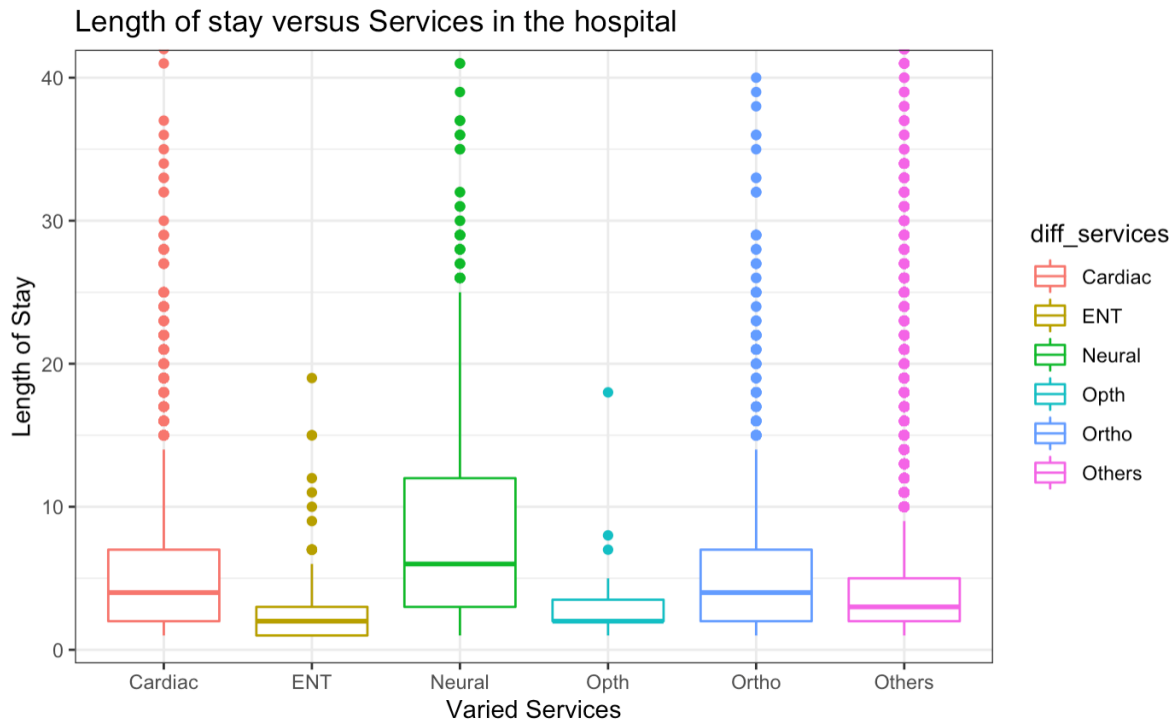
E. Principal Operations for MS-DRG 5 and 8



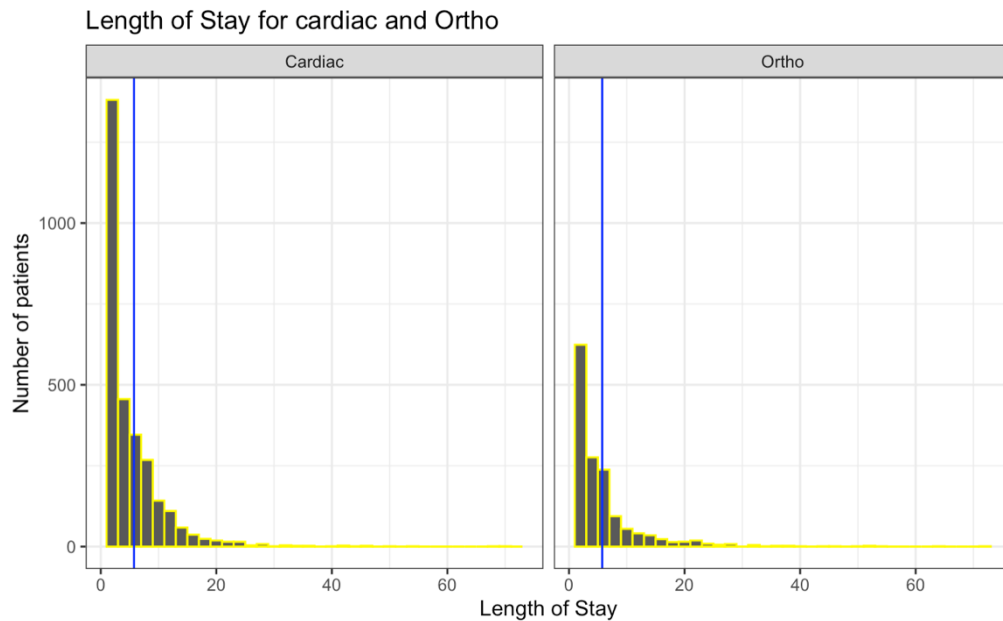
F. Profitability proportion of all the services



G. Length of Stay for all Services



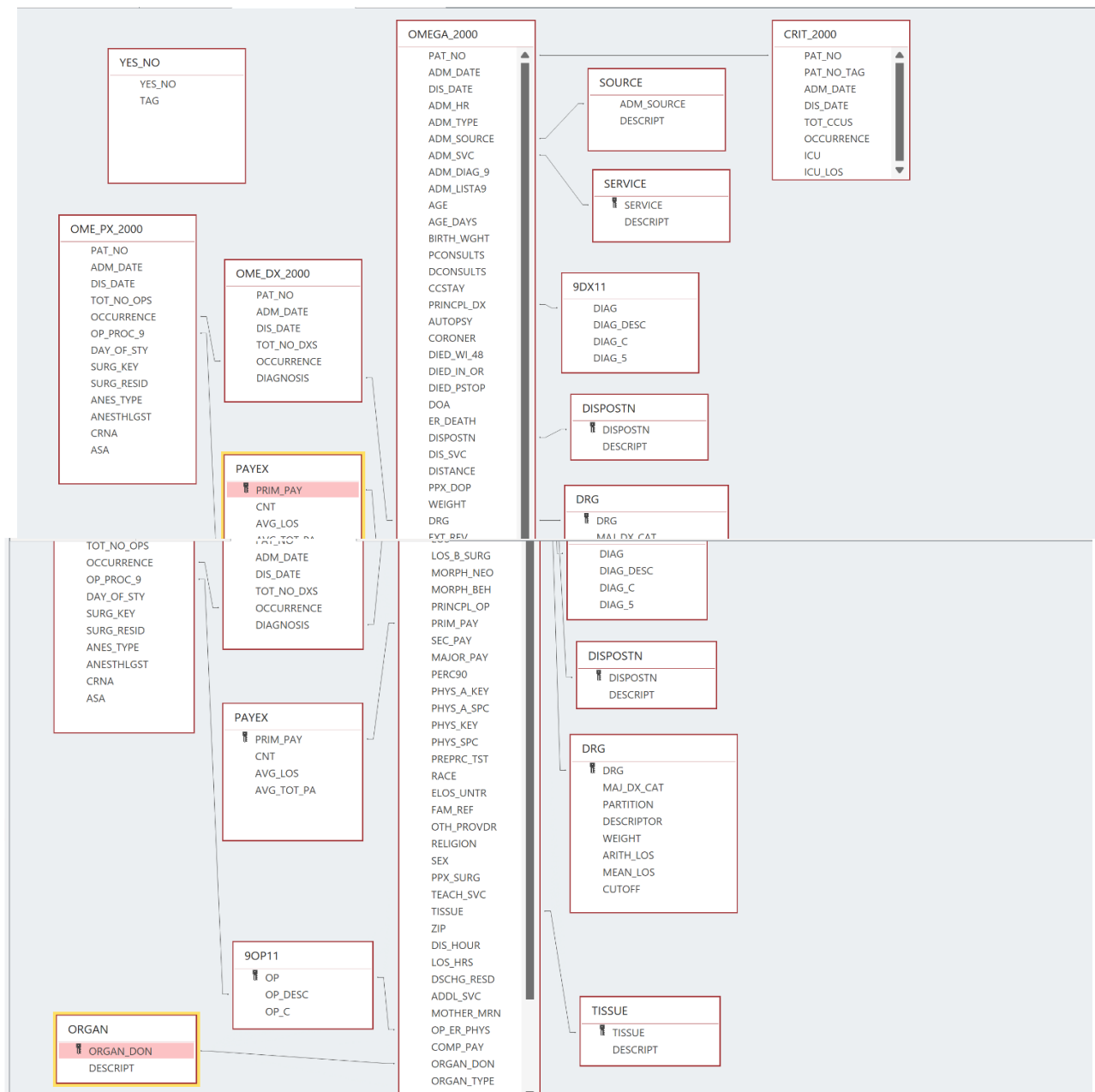
G.1. Length of Stay for cardiac and Ortho



H. Emergent Services versus Elective for all services

ADM_TYPE <chr>	DESCRIPT <chr>	number_of_records <int>	prop <dbl>
EMERGENT	HOME/ROUTINE	6436	0.7623785833
ELECTIVE	HOME/ROUTINE	5567	0.9306252090
EMERGENT	HOME HEALTH CARE OR HOME HOSPICE CARE	789	0.0934612651
EMERGENT	DIED	317	0.0375503435
EMERGENT	SKILLED NURSING FACILITY	313	0.0370765222
ELECTIVE	HOME HEALTH CARE OR HOME HOSPICE CARE	200	0.0334336342
EMERGENT	TRANSFERRED TO REHAB FROM OTHER SYSTEM FACILITY	173	0.0204927742
EMERGENT	INTERMEDIATE CARE FACILITY	132	0.0156361052
EMERGENT	AGAINST MEDICAL ADVICE	60	0.0071073205
EMERGENT	TRANSFERRED TO LT PSYCH FROM OTHER SYSTEM FACILITY	59	0.0069888652
EMERGENT	TRANSFERRED TO ANOTHER ACUTE SHORT TERM HOSPITAL	56	0.0066334992
EMERGENT	ADULT FOSTER CARE/GROUP HOME	44	0.0052120351
ELECTIVE	TRANSFERRED TO REHAB FROM OTHER SYSTEM FACILITY	43	0.0071882314
ELECTIVE	SKILLED NURSING FACILITY	39	0.0065195587
ELECTIVE	TRANSFERRED TO OMEGA FROM OTHER SYSTEM FACILITY	34	0.0056837178
ELECTIVE	INTERMEDIATE CARE FACILITY	32	0.0053493815
EMERGENT	OTHER FACILITY (EG PRISON)	30	0.0035536603
EMERGENT	TRANSFERRED TO PHYSICIAN REHAB OTHER THAN OMEGA	18	0.0021321962
ELECTIVE	DIED	15	0.0025075226
ELECTIVE	TRANSFERRED TO ANOTHER ACUTE SHORT TERM HOSPITAL	15	0.0025075226
ELECTIVE	AGAINST MEDICAL ADVICE	13	0.0021731862
EMERGENT	TRANSFERRED TO OMEGA FROM OTHER SYSTEM FACILITY	12	0.0014214641
ELECTIVE	OTHER FACILITY (EG PRISON)	8	0.0013373454
ELECTIVE	ADULT FOSTER CARE/GROUP HOME	7	0.0011701772
ELECTIVE	TRANSFERRED TO LT PSYCH FROM OTHER SYSTEM FACILITY	4	0.0006686727
ELECTIVE	TRANSFERRED TO PHYSICIAN REHAB OTHER THAN OMEGA	4	0.0006686727
ELECTIVE	TRANSFERRED TO LONG TERM HOSPITAL	1	0.0001671682
EMERGENT	INPATIENT HOSPICE	1	0.0001184553
EMERGENT	TRANSFERRED TO LONG TERM HOSPITAL	1	0.0001184553
EMERGENT	TRANSFERRED TO SUB ABUSE FROM OTHER SYSTEM FACILIT	1	0.0001184553

I. Relationship Tables



References

Centers for Disease Control and Prevention. “Racial and Ethnic Disparities in Heart Disease.” *Health, United States Spotlight*, CDC, Apr. 2019, https://www.cdc.gov/nchs/hus/spotlight/hus_spotlight_december2017.pdf.

Dubas-Jakóbczyk, et al. “The Association between Hospital Financial Performance And The Quality of Care—A Scoping Review Protocol.” *Syst Rev* 10, 221 (2021). <https://doi.org/10.1186/s13643-021-01778-3>.

Jia, Huixue et al. “Impact of Healthcare-Associated Infections on Length of Stay: A Study in 68 Hospitals in China.” *BioMed research international* vol. 2019 2590563. 18 Apr. 2019, doi:10.1155/2019/2590563

Manary, Matthew, et al. “Payer Mix & Financial Health Drive Hospital Quality: Implications For Value-Based Reimbursement Policies.” *Finding*, Behavioral Science & Policy Association, 2015, https://behavioralpolicy.org/wp-content/uploads/2017/02/BSP_vol1is1_Manary.pdf

Office of Patient Protection. “External Review Process Overview.” *Mass.gov*, <https://www.mass.gov/service-details/external-review-process-overview>.

Remis, Kathleen. “Increasing Profitability In Orthopaedics.” *Carestream*, 30 Sept. 2021, <https://www.carestream.com/blog/2021/08/24/increasing-profitability-in-orthopaedics/>.

Shalchi, Homa. “Addressing Racial Disparities in Orthopedic Care.” *Baylor College of Medicine*, 2 Nov. 2020, <https://www.bcm.edu/news/addressing-racial-disparities-in-orthopedic-care>.

UCSF Health. “Percutaneous Coronary Intervention (PCI).” *Ucsfhealth.org*, UCSF Health, 3 Sept. 2021, [https://www.ucsfhealth.org/treatments/percutaneous-coronary-intervention#:~:text=Percutaneous%20coronary%20intervention%20\(PCI\)%20refers,pain%20or%20shortness%20of%20breath](https://www.ucsfhealth.org/treatments/percutaneous-coronary-intervention#:~:text=Percutaneous%20coronary%20intervention%20(PCI)%20refers,pain%20or%20shortness%20of%20breath).

TalentLyft. (n.d.). *What is carve-out?* Recruiting and Hiring Resources. Retrieved April 24, 2022, from <https://www.talentlyft.com/en/resources/what-is-carve-out>