

DATA TABLES ASSIGNMENT – MICHAEL HORNE

The primary aim of the quality improvement (QI) project is to reduce the average days wait (ADW) for patients trying to get a new consult appointment in the primary cardiology clinic. As such, per the Sylvia and Terhaar text, the unit of analysis for the primary aim best aligns with an “event” – the request for a new consult appointment and the associated delay experienced before an appointment is available – versus a “population”. Accordingly, table 4.2 in the text is applicable for my project. However, some of the sub-aims are related to both “events” and “populations”. For the purpose of completing the assignment, I’ll include a population description (in the table 4.1 format) as well.

It is also important to understand the driver of consult appointment ADW is not related to the characteristics of the population (demographics, types of cardiology conditions, etc). Rather, the number of requests and the capacity determine the ADW. The type of cardiac condition, or other demographic characteristics of the population, do not affect the scheduled length of a consult appointment and thus do not affect ADW. For this reason, a pre/post analysis of population characteristics was not conducted – only the total number of consult requests as noted in the table below. This was discussed and approved in the methods section last semester as noted: *“Pre-post intervention analysis of clinical / demographic characteristics of the patient population was not conducted since prior driver analysis showed these characteristics to not be a material influence in ADW. Patient volumes and clinic capacity were determined to be the primary factors and were tracked as baseline measures noted above.”*

I do have some demographic/clinical data for the population (pre and post). I could go back and change the methods section and include it (and in the analysis) if you feel it is important, but as noted, Dr. Estes approved my comments above (also reviewed with Dr. Cook). Any differences in the pre/post population characteristics are not felt to be confounding variables for the analysis. Additionally, given the stability of the Kaiser population, there were actually few differences in the total pre/post number of patients or their characteristics.

Population Description Table

Name of population	Cardiology patients for a regional Managed Care Organization (MCO), serviced by cardiologist in the primary cardiology clinic
Pre-intervention subgroup	Cardiology patients trying to obtain new consult appointments in the primary cardiology clinic from 7/1/18-12/31/18
Post-intervention subgroup	Cardiology patients trying to obtain new consult appointments in the primary cardiology clinic from 1/1/19-6/30/19
Sources of data	Database for the schedule module of EHR system
Numbers expected	Total cardiology population seen in primary cardiology clinic for 2H18 was 5,674; The number trying to obtain new consult appointments in 2H18 was 1,297; These numbers are not expected to change materially in the post intervention period (1H19) based on the stability of MCO population and trends from the last several years; It is important to note the same patient may be counted more than once in the total population number (since a patient may be seen more than once in a 6 month period). However, the number of new consult appointments represents unique patients, with no patient counted more than once (since a patient can only have one new consult visit in a 6 month period – additional visits would be classified as follow-up visits)
Inclusion / exclusion criteria	Inclusion: Must be a member of the regional MCO with a referral (from any source) to a cardiologist in the MCO primary cardiology clinic and seeking a new cardiology consult clinic appointment (in the dates noted above); Does not have to have an existing cardiology diagnosis Exclusion: No patients meeting the inclusion criteria are excluded unless a new consult appointment was not made – in that case, no measurement data associated with the consult appointment request, including ADW, was recorded
Time frame	Cardiology patients for a regional MCO seeking new consult appointments in the primary cardiology clinic in the pre-intervention period of 2H18 or the post intervention period of 1H19

Event Description Table

Name of event	New cardiology consult appointment request for the primary cardiology clinic for a regional MCO
Pre-intervention events	Requests for new cardiology consult appointments in the primary cardiology clinic for the regional MCO from 7/1/18-12/31/18
Post-intervention events	Requests for new cardiology consult appointments in the primary cardiology clinic for the regional MCO from 1/1/19-6/30/19

Sources of data	Database for schedule module of EHR system
Numbers expected	The number of requests was 1,297 in 2H18; This number is not expected to change materially in the post intervention period (1H19) based on the stability of MCO population and trends from the last several years; The number of events recorded for measurement, per the inclusion/exclusion criteria below, is unique in that only one new (recorded) consult request can occur per patient
Inclusion / exclusion criteria	Inclusion: The consult appointment request must have come from, or on behalf of, a member of the regional MCO with a referral (from any source) to a cardiologist in the regional MCO primary cardiology clinic and seeking a new cardiology consult clinic appointment (in the dates noted above) Exclusion: No events meeting the inclusion criteria are excluded unless a new consult appointment was not made – in that case, no measurement data associated with the consult appointment request, including ADW, was recorded
Time frame	Baseline requests (pre-intervention) meeting the criteria were measured in the 2H18, while post-intervention requests were measured for 1H19

Of note, the tables above describe the population and events associated with primary and sub aim outcome measures. However, another population was affected by the intervention. This group was the inpatient population who were cared for under the new hospital service. There are no outcome measures associated with this population since it is not the focus of the QI, but there were baseline measures to ensure this population was not negatively affected by the intervention. At a summary level, this population included all MCO patients seen in the primary cardiology hospital who had an inpatient cardiologist assigned to their care team. The pre-intervention subgroup included all inpatients in the defined population seen in the hospital by a cardiologist from 7/1/18-12/31/18. The post intervention subgroup included all inpatients in the defined population seen in the hospital by a cardiologist (or a cardiology NP as part of the new cardiology hospital service) from 1/1/19 – 6/30/19. The source of data for the pre/post baseline measures was the hospital EHR. Approximately 4,000 such inpatients were seen in 2H18 and a similar number is expected for 1H19. To be included, the inpatient had to be a member of the MCO in the hospital for any reason and seen by a cardiologist (in the pre-intervention period) or cardiology NP (in the post-intervention period). There were no exclusions, and the time frame was 2H18 for baseline data and 1H19 for comparison data.

Outcome Measure Table

Variable	Description	Source	Range	Level	Time frame	Stat test
<i>PRIMARY AIM – AVERAGE DAYS WAIT (ADW) FOR CONSULT APPOINTMENTS</i>						
PreADW	ADW per patient for consult appointments for 2H18	Calculated field in EHR schedule module database	0-40	Continuous, ratio	Calculated as a weekly, quarterly, and 6 month average for 2H18 – goal is measured on 6 month average	Run chart plus Independent t-test using 26 data points (weekly average) for the pre and post 6 month periods
PostADW	ADW per patient for consult appointments for 1H19	Calculated field in EHR schedule module database	0-40	Continuous, ratio	Calculated as a weekly, quarterly, and 6 month average for 1H19 – goal is measured on 6 month average	Run chart plus Independent t-test using 26 data points (weekly average) for the pre and post 6 month periods
<i>SECONDARY AIM 1 – PATIENT SATISFACTION WITH CARDIOLOGY ACCESS</i>						
PrePTACCESSSAT	Patient satisfaction score with access for 2H18	Calculated field from patient survey database	0-100	Continuous, ratio	Calculated as a quarterly and 6 month average for 2H18 – goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages
PostPTACCESSSAT	Patient satisfaction score with access for 1H19	Calculated field from patient survey database	0-100	Continuous, ratio	Calculated as a quarterly and 6 month average for 1H19– goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages
<i>SECONDARY AIM 2 – CARDIOLOGY READMISSION RATE</i>						
PreREADMT	CMS defined cardiology hospital 30 day readmissions for 2H18	Calculated field from admissions claims database	0-100	Continuous, ratio	Calculated as a quarterly and 6 month average for 2H18 – goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages
PostREADMT	CMS defined cardiology hospital 30 day readmissions for 1H19	Calculated field from admissions claims database	0-100	Continuous, ratio	Calculated as a quarterly and 6 month average fir 1H19 – goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages

Variable	Description	Source	Range	Level	Time frame	Stat test
<i>SECONDARY AIM 3 – CONSULT APPOINTMENT CANCELLATION RATE</i>						
PreCANCEL	Cancellations for Cardiology Consult appointments	Calculated field in EHR schedule module database	0-100	Continuous, ratio	Calculated as a monthly, quarterly, and 6 month average for 2H18 – goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages
PostCANCEL	Cancellations for Cardiology Consult appointments	Calculated field in EHR schedule module database	0-100	Continuous, ratio	Calculated as a monthly, quarterly, and 6 month average for 1H19 – goal is measured on 6 month average	No statistical test, simple comparison of pre and post quarterly and half year averages
<i>SECONDARY AIM 4 – POST INTERVENTION PROVIDER SATISFACTION</i>						
PostPROVIDERSAT	Provider satisfaction score with intervention	Calculated field from project developed online survey database	0-100	Continuous, ratio	Calculated as a one-time measure 2 weeks after completion of the intervention (July 2019)	No statistical test, simple analysis of the one-time post survey

Calculation of primary aim measure (Reduce Average wait times for cardiologist clinic consult visits from 28 for 2H18 to 14 for 1H19):

Pre-Intervention group:

- Weekly: Sum of preADW for all new consult appointment requests for each week in 2H18 / Total number of new consult appointment requests for each corresponding week in 2H18
- Quarterly: Sum of preADW for all new consult appointment requests for each quarter (3Q, 4Q) in 2H18 / Total number of new consult appointment requests for each corresponding quarter in 2H18
- 6 month average: Sum of preADW for all new consult appointment requests for 2H18 / Total number of new consult appointment requests for 2H18

Post-Intervention group:

- Weekly: Sum of postADW for all new consult appointment requests for each week in 1H19 / Total number of new consult appointment requests for each corresponding week in 1H19
- Quarterly: Sum of postADW for all new consult appointment requests for each quarter (1Q, 2Q) in 1H19 / Total number of new consult appointment requests for each corresponding quarter in 1H19
- 6 month average: Sum of postADW for all new consult appointment requests for 1H19 / Total number of new consult appointment requests for 1H19

The weekly, quarterly, and 6 month average calculations are based on total days wait and total patient requests for the applicable period. They are not an averages of averages. However, the t-test will be conducted using the 26 weekly average data points for both the pre and post analysis. The t-test will be conducted in this manner since individual ADW for all approximately 1200 patients in each half is not available. The lowest level of granularity in the database is ADW, at the various intervals (weekly, quarterly, half). Since the number of patients requesting consult appointments weekly does not have significant variance, and thus no mathematical issues from weighting of data averages from different weeks, there should not be a material impact using the weekly averages for the t-test. In fact, the mean from the t-test for the 2H18 (using 26 weekly averages) compared to the actual mean of all 2H18 1200 data points in the database was nearly identical.

The t-test for independent samples is a parametric statistical test used to analyze the means in two unrelated groups. The groups - pre and post intervention – in this project are independent. Like all parametric tests, it assumes the data level is interval or ratio and the dependent variable is reasonably normally distributed in each group, and each group is of similar size. However, the t-test is noted as a robust test with respect to the assumption of normality. This means that some deviation away from normality does not have a large influence on Type I error rates for t-tests. The data level for the primary outcome variable in this project is ratio, and the groups are the same size. For the pre-intervention data for this project, the skewness was 0.36. A 90% range of values of skewness for a given sample size can be used as a guideline to help determine if the skew value suggests the data is from a distribution that is not normal enough for a parametric analysis (Doane & Seward, 2011). Using that range for the sample size of 26 in the project, the 0.36 skew falls well within the 90% limits of -0.726 to 0.726. As such, the pre-intervention data passes the test of reasonable normality. The same analysis will occur on the post intervention data to verify the independent t test may be used. If it is determined that the independent t-test is not appropriate, the non-parametric Mann-Whitney U test will be used instead.

Doane, D. P., & Seward, L. E. (2011). Measuring skewness: A forgotten statistic? *Journal of Statistics Education*, 19(2). Retrieved from <http://jse.amstat.org/v19n2/doane.pdf> on 9/8/19

Calculation of sub-aim 1 (Improve average clinic patient satisfaction with access from 39% for 2H18 to 55% for 1H19):

Pre-Intervention group:

- Quarterly: Sum of all PrePTACCESSSAT patients scores indicating “very satisfied” for access (5 on scale of 1-5) for each quarter (3Q, 4Q) in 2H18 / total number of patients responding to the patient access survey question in the corresponding quarter in 2H18
- 6 month average: Sum of all PrePTACCESSSAT patients scores indicating “very satisfied” for access (5 on scale of 1-5) for 2H18 / total number of patients responding to the patient access survey question in 2H18

Post-Intervention group:

- Quarterly: Sum of all PostPTACCESSSAT patients scores indicating “very satisfied” for access (5 on scale of 1-5) for each quarter (1Q, 2Q) in 1H19 / total number of patients responding to the patient access survey question in the corresponding quarter in 1H19
- 6 month average: Sum of all PostPTACCESSSAT patients scores indicating “very satisfied” for access (5 on scale of 1-5) for 1H19 / total number of patients responding to the patient access survey question in 1H19

The lowest level of granularity in the database is average patient satisfaction with access over quarterly and half year periods. Since there are only 2 data points available in both the pre and post periods, no statistical test is applicable or needed.

Calculation of sub-aim 2 (Reduce 30-day Cardiology readmission rates from 13.2% for 2H18 to 12% for 1H19):

Pre-Intervention group:

- Quarterly: Sum of all CMS defined PreREADMT readmissions, defined as the number of ACS and HF patients (based on DRG codes) who were readmitted to any hospital for any reason within 30 days of discharge from the primary cardiology hospital in the study for each quarter (3Q, 4Q) in 2H18 / total number of ACS and HF patients discharged for each corresponding quarter in 2H18
- 6 month average: Sum of all CMS defined PreREADMT readmissions, defined as the number of ACS and HF patients (based on DRG codes) who were readmitted to any hospital for any reason within 30 days of discharge from the primary cardiology hospital in the study for 2H18 / total number of ACS and HF patients discharged for 2H18.

Pre-Intervention group:

- Quarterly: Sum of all CMS defined PreREADMT readmissions, defined as the number of ACS and HF patients (based on DRG codes) who were readmitted to any hospital for any reason within 30 days of discharge from the primary cardiology hospital in the study for each quarter (1Q, 2Q) in 1H19 / total number of ACS and HF patients discharged for each corresponding quarter in 1H19
- 6 month average: Sum of all CMS defined PreREADMT readmissions, defined as the number of ACS and HF patients (based on DRG codes) who were readmitted to any hospital for any reason within 30 days of discharge from the primary cardiology hospital in the study for 1H19 / total number of ACS and HF patients discharged for 1H19

The lowest level of granularity in the database is average readmission rate over quarterly and half year periods. Since there are only 2 data points available in both the pre and post periods, no statistical test is applicable or needed.

Calculation of sub-aim 3 (Reduce consult appointment cancellation rate from 25% for 2H18 to 15% for 1H19):

Pre-Intervention group:

- Monthly: Sum of PreCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for each month in 2H18 / Total number of consult appointments for each corresponding month in 2H18
- Quarterly: Sum of PreCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for each quarter in 2H18 / Total number of consult appointments for each corresponding quarter in 2H18
- 6 month average: Sum of PreCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for 2H18 / Total number of consult appointments for 2H18

Post-Intervention group:

- Monthly: Sum of PostCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for each month in 1H19 / Total number of consult appointments for each corresponding month in 1H19

- Quarterly: Sum of PostCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for each quarter in 1H19 / Total number of consult appointments for each corresponding quarter in 1H19
- 6 month average: Sum of PostCANCEL, defined as the number of cancellations, for any reason, for cardiology consult appointments for 1H19 / Total number of consult appointments for 1H19

The lowest level of granularity in the database is cancellation rate over monthly, quarterly and half year periods. Since this sub-aim is being assessed solely based on research which suggested it might be a potential outcome, and not a primary interest of concern, no statistical test was used. However, the monthly data was examined to ensure the half year averages did not mask any significant monthly variations.

Calculation of sub-aim 4 (Achieve 90% provider satisfaction with the intervention):

Post-Intervention:

- Post Intervention average: Sum of all PostPROVIDERSAT scores from affected providers (11 cardiologists and 3 NPs who were part of the new hospital services and primary cardiology clinic) indicating overall job satisfaction “improved” or “significantly improved” (“4” or “5” on 1-5 Likert scale) as a result of the intervention / total number of providers responding to the survey

Three survey questions were used: (1) How did clinic job satisfaction change as a result of the intervention; (2) How did hospital job satisfaction change as a result of the intervention, and; (3) How did overall job satisfaction change as a result of the intervention. The goal was based on question 3, but the other questions were analyzed. This was not a pre-validated survey but a very basic 3 question survey. Internal consistency / reliability will be assessed after the survey using Cronbach’s alpha across the three questions.