Post-acute Care Preferred Provider Network Skilled Nursing Facility Selection as a Function of Repisodic Mobile Application Settings

Statistical Analysis Plan

February 16, 2023

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Brief Summary

This study tests whether changing the relative order of presentation of post acute care skilled nursing facilities (SNFs) in the Repisodic application, i.e., presenting preferred SNFs (P-SNFs) first, increases selection of, and discharges to, P-SNFs and decreases lengths of stay (LoS) for Geisinger patients discharged to SNFs. Along with the order of P-SNFs, the study also assesses whether a short video reviewing the benefits of care coordination in P-SNFs increases patient election to transfer to one.

Randomization

Case managers were randomized to one of two conditions upon their account creation (Default List vs. P-SNF Top-Sorted List). Patients were independently randomized to one of two conditions when Repisodic lists were generated for them (Full List/Full Map/Default Video vs. P-SNF List/P-SNF Map/P-SNF Video).

Project Status

All interventions were launched on 5/28/2021 and data collection is ongoing. Outcome data have not been examined as a function of experimental condition. However, only patients who are ultimately discharged to a SNF can be included in our analyses, and not all randomized patients are ultimately discharged to SNFs (e.g., patients who were discharged home, despite initially being considered for a SNF). So, to assess enrollment progress throughout the study, we need to extract data on patients' discharge locations and remove patients who were not discharged to a SNF.

Our original primary outcome time frame was 12 months or as long as it takes to reach N=4,000, whichever occurs first. However, we decided to extend our outcome time frame to 24 months or as long as it takes to reach N=5,000 patients. We made this change because we noticed an imbalance in the number of case managers assigned to the two conditions, such that by chance, there were more active case managers in the P-SNF top-sorted condition (N = 104 as of 1/2/23) compared with the default list condition (N = 70 as of 1/2/23). We ran a simulation power analysis to reassess how many patients should be in our final sample size, given the imbalance in case manager assignment, and determined that 5,000 patients would yield sufficient power to detect a 4% increase in P-SNF selection.

However, by the time we made the decision to change our inclusion criteria, enrollment exceeded 5,000 patients. We plan to include all eligible patients enrolled through 1/2/23 in analyses, because we have already pulled enrollment data on these patients.

Power Analysis

Data will be collected from 5,000 patients who were discharged to SNFs. We expect to have 80% power to detect a 4% increase (34% to 38%) in selection of P-SNFs at two-tailed $p < .05$.

Analysis Approach

Analyses described below represent our planned analyses assuming statistical assumptions are met. If assumptions are not met, we will run alternative tests appropriate for the outcome distribution (e.g., non-parametric tests).

Recent work suggests that OLS regressions are appropriate in randomized experiments with binary outcome variables such as ours (Gomilla, 2021). Therefore, for binary outcome variables, we default to running OLS regressions.

Some of our originally preregistered outcome descriptions mentioned comparing Time 1, before the Repisodic app was deployed, to Time 2, during the study, after launch of the app. Upon learning that it is infeasible to obtain comparable Time 1 measurements and include them in analysis, we decided to omit Time 1 to focus analyses entirely on comparing outcomes during the study period (i.e., the primary causal investigation).

Primary Outcomes

P1: Overall LoS (system/case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Difference in LoS (in days) for patients as a function of case manager study condition

Analysis: We will run a gamma regression to test whether LoS differs between patients with a case manager in Default List versus P-SNF Top-Sorted groups.

P2: P-SNF placement (system/case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Difference in proportion of discharges of patients to P-SNFs (out of P-SNFs + NP-SNFs) as a function of case manager study condition.

Analysis: We will run a beta regression to test whether there is a difference in the proportion of patient discharges to P-SNFs for the case manager Default List and P-SNF Top-Sorted groups.

P3: P-SNF pre-selection (case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Number of P-SNFs selected by case managers for inclusion in the patients' lists, to assess the direct impact of Repisodic changes on case manager behavior; this is the first decision in the process, before patients' selections and SNF availability factor into the final discharge decision and placement.

Analysis: We will run a negative binomial regression to test whether the number of P-SNFs pre-selected differs as a function of case manager study arm, clustering standard errors at the case manager level.

P4: P-SNF selection (case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Number of P-SNFs selected by patients to help assess the downstream impact of Repisodic changes on patient behavior following case manager pre-selection, again omitting the influence of SNF availability.

Analysis: We will run a negative binomial regression to test whether the number of P-SNFs selected differs as a function of case manager condition, clustering standard errors at the case manager level.

Note: Retrospective data prior to the study period suggested that only ~15% of patients indicate their selections in the Repisodic app. Therefore, data will be missing for many patients in this analysis. However, we will run this analysis on patients with available data.

P5: P-SNF percent selected (case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Percentage of patients who selected at least one P-SNF, to help assess the downstream impact of Repisodic changes on patient behavior following case manager pre-selection.

Analysis: We will run a beta regression to test whether the percentage of patients who selected one or more P-SNFs differs as a function of case manager condition, clustering standard errors at the case manager level.

Note: Retrospective data prior to the study period suggested that only ~15% of patients indicate their selections in the Repisodic app. Therefore, data will be missing for many patients in this analysis. However, we will run this analysis on patients with available data.

P6: LoS (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=4,000, whichever occurs first]

LoS for patients (in days).

Analysis: We will run a gamma regression to test whether LoS differs as a function of patient condition, clustering standard errors at the case manager level.

P7: P-SNF placement (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Patient was discharged to a P-SNF: yes/no.

Analysis: We will run an OLS regression to test whether patient P-SNF placement rates differ as a function of patient condition, clustering standard errors at the case manager level.

P8: P-SNF selection (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Patient selected a P-SNF for discharge: yes/no. This is a more direct reflection of patient behavior, not yet moderated by bed availability and other real-world considerations that affect Outcome 7.

Analysis: We will run an OLS regression to test whether patient P-SNF selection rates differ as a function of patient condition, clustering standard errors at the case manager level.

Note: Retrospective data prior to the study period suggested that only ~15% of patients indicate their selections in the Repisodic app. Therefore, data will be missing for many patients in this analysis. However, we will run this analysis on patients with available data.

Secondary Outcomes

S1: Time to pre-select a SNF (case manager level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Time to pre-select a SNF/SNF list in Repisodic (in minutes), from the time that the case manager first signs into the iPad to when the case manager saves the list to send to the patient. This measure excludes cases in which the task was not completed.

Analysis: We will run an OLS regression to test whether the time to pre-select a SNF list in Repisodic differs as a function of case manager condition, clustering standard errors at the case manager level.

S2: Time to select a SNF (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Time to select a SNF in Repisodic (in minutes), from the time that the patient first signs or is signed into the iPad to when the patient clicks to send the list to the case manager. This measure excludes cases in which the task was not completed.

Analysis: We will run an OLS regression to test whether the time to select a SNF list in Repisodic differs as a function of patient condition, clustering standard errors at the case manager level.

Note: Retrospective data prior to the study period suggested that only ~15% of patients indicate their selections in the Repisodic app. Therefore, data will be missing for many patients in this analysis. However, we will run this analysis on patients with available data.

Other Outcome Measures

O1: LoS for patients who had a P-SNF as an option (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

LoS for patients (in days). Excluding patients who did not have at least one P-SNF on the full list they were provided.

Analysis: We will run a gamma regression to test whether LoS differs as a function of patient condition, clustering standard errors at the case manager level.

O2: P-SNF placement for patients who had a P-SNF as an option (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Patient was discharged to a P-SNF: yes/no. Excluding patients who did not have at least one P-SNF on the full list they were provided.

Analysis: We will run an an OLS regression to test whether patient P-SNF placement rates differ as a function of patient condition, clustering standard errors at the case manager level.

O3: P-SNF selection for patients who had a P-SNF as an option (patient/caretaker level) [Time Frame: 24 months or as long as it takes to reach N=5,000, whichever occurs first]

Patient selected a P-SNF for discharge: yes/no. Excluding patients who did not have at least one P-SNF on the full list they were provided. This is a more direct reflection of patient behavior, not yet moderated by bed availability and other real-world considerations that affect Outcome O2.

Analysis: We will run an an OLS regression to test whether patient P-SNF selection rates differ as a function of patient condition, clustering standard errors at the case manager level.

Note: Retrospective data prior to the study period suggested that only ~15% of patients indicate their selections in the Repisodic app. Therefore, data will be missing for many patients in this analysis. However, we will run this analysis on patients with available data.