**Does Scheduling a Post-Discharge Visit with a Primary Care Physician Increase Rates of Follow-up and Decrease Readmissions?**

*Appendix Materials*

*INSTRUMENTAL VARIABLE ANALYSIS*

We used an instrumental variable approach to analyze the effects of the post-discharge appointment service on the likelihood of visiting a PCP within 7 days, being readmitted to the hospital within 30 days, and visiting the ED within 30 days. Specifically, we take advantage of the fact that the post-discharge appointment service is unavailable over the weekend.

*Choice of instrument*

In order for the interaction between day of admission dummies and the post-period dummy to be a valid instrument, day of admission needs to be correlated with take-up of the intervention during the post-period, but day of admission should not be correlated with changes in other variables between the pre- and post-periods that are also correlated with outcomes.

All analyses include fixed effects for day of the week as well as year fixed effects to capture anything about certain days of the week that might affect outcomes and anything that is changing over time across all days of the week that might affect outcomes. This implies that the instrumental variable analysis uses only variation in the intervention that comes from differential changes in the use of the intervention across days of the week between the pre- and post-periods. Therefore, to introduce bias in our analyses a factor that is correlated with patient outcomes would have to be correlated differently with day of the week *before vs. after* the intervention was implemented. This would either require some random change in behavior correlated with day of week of admission (e.g. if for some reason unrelated to the intervention, sicker patients systematically shifted from being admitted on Tuesdays in the period before the intervention was implemented to Fridays in the period after the intervention was implemented). This mechanism seems unlikely, suggesting that the instruments will be valid.

We use a series of instrumental variables that are defined as day of the week times post-intervention indicator variables, and we include day of the week, and year fixed effects with gender and age controls. Though we perform the estimation using instrumental variables, it has similar intuition to differences-in-differences estimation. For example, this technique estimates the effect of using the post-discharge appointment service on the likelihood of having a PCP follow-up visit in 7 days by comparing the change in PCP follow-up after the intervention is implemented for admission days that have high use of intervention to the change in PCP follow-up visits after the intervention for admission days of the week that have lower use of the intervention.

*Demonstrating viability of instruments*

In Figure A1 and A2, we show a graphical representation of how use of the post-discharge appointment service rate varies between days of the week over time. Admissions later in the work week (Thursday or Saturday) are often ready to be discharged over the weekend when the post-discharge intervention service is not available. There is a roughly 20 percentage point greater likelihood of use of the post-discharge appointment service tool between admissions on Sunday and admissions on Friday.

In Table A2 we show a regression where the outcome is use of the post-discharge appointment service tool and where we have used an interaction based on day of week of admission multiplied by post-2009 indicator. The regression also includes gender and age with fixed effects for day of the week and year. Consistent with Figures A1 and A2, there is much less use of the post-discharge appointment service tool with Friday and Saturday admissions.

To determine whether the instrument is “strong” we consider the characterization outlined by Stock and Yogo (2005), which tests for potential size distortions in instrumental variables. We use limited information maximum likelihood estimation (LIML), because of its superior convergence with multiple instruments as outlined in Stock and Yogo (2005). The statistical test for instrument strength appears in Table A3. Given that the minimum Eigen value statistic (11.3) is far larger than the threshold of 4.45, we can reject the null hypothesis that the instruments are weak.

*Instrumental variable analyses*

Now that we have established the validity of the instruments, we now conduct the instrumental variable regression (Table 3). We estimate that use of the post-discharge appointment service increases the probability of visiting a PCP within 7 days by 33.4 percentage points (p<0.05). The estimated effects of the post-discharge appointment service on having a readmission within 30 days is -2.5 percentage points and on having an ED visit -4.8 percentage points. Neither is statistically significant and confidence intervals are wide. In sensitivity analyses, we obtained similar results when we considered readmission and ED visits within 15 days and within 60 days.

Thus, the instrumental variable approach supports the other analyses and finds that the post-discharge appointment service effectively increases rates of early PCP follow-up. The instrumental variable analysis provides little information about the effects of readmission rates due to wide confidence intervals.

References for Appendix:

Stock, J. H., and M. Yogo. 2005. Testing for weak instruments in linear IV regression. In Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg, ed. D. W. K. Andrews and J. H. Stock, 80–108. New York: Cambridge University Press.