

Mobility Metrics as a Predictor for Inpatient Falls

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Introduction

According to the Agency for Healthcare Research and Quality, anywhere from 700,000 to 1,000,000 patients fall in during their stay in the hospital. With research showing 1/3 of falls can be prevented, understanding injurious falls among hospitalized patients is critical for prevention and overall care. Efforts in fall prevention are thought to potentially limit patient mobility during hospitalization. Better understanding of the relationship between falls and mobility is needed. We hope that the study will yield predictive indicators that pattern injurious falls, such as certain patient characteristics that increase fall risk, which will allow us to better understand and take preventative measures against injurious patient falls.

Objectives

To analyze trends in two measures of patient mobility (AM-PAC and JH-HLM) to investigate the relationship between injurious falls and patient mobility during their hospital stay.

Materials and Methods

Using data of 47,801 hospital patients, 138 fall 47,663 no fall, collected prior to the Covid-19 pandemic, we used RStudio to analyze trends between the two mobility metrics and if the patient had injuriously fallen or not.

We first compiled the data into two subsets: fallers and no-fallers. From there we compared the AM-PAC t-scores and JH-HLM max scores between fall and no-fall patients and analyzed the effects of length of stay on either mobility scores. We applied a linear model for patient mobility between patients who had fellane to those who haven't for patients who had stayed three days or more in the hospital, which was done in order to catch more meaningful trends.

Furthermore, we traced and visualized patient mobility throughout length of stay. This was done both for the whole dataset as well as random patients in order to look at general trends in mobility to capture a difference between fallers and non-fallers as well as to notice any trends in mobility leading up to a fall that could serve as a predictor. We then separated patients with injurious falls into three categories (short, intermediate and long) based on their length of stay before their first fall. We randomly sampled some patients within each category in order to zoom in on some potential trends of mobility before fall among these patients.

Results

Patient Length of Stays for Non-Fallers

Minimum	1st Quartile	Median	Mean	3rd Quartile	Max
1.181	3.340	5.233	7.741	8.630	235.167

Patient Length of Stays for Fallers

Minimum	1st Quartile	Median	Mean	3rd Quartile	Max
1.951	9.180	15.079	21.973	23.048	169.925

Figure 1 - Distributions of Patient Length of Stays

Patients who had not fallen spend less time in hospital than patients who had. Was important for our analysis as it helped us stratify the data set by length of stay in order to be comparing patients who had similar enough characteristics between the fall and no fall categories.

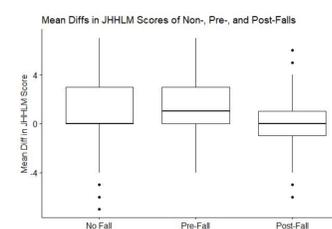
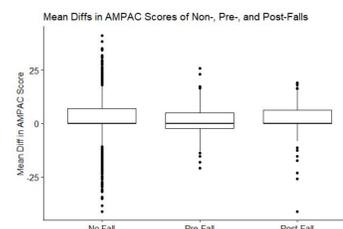


Figure 2 - Mean Differences in Patient Mobility for No-Fall, Pre-Fall, Post-Fall

Patients who fall, leading up to their fall experience a lesser or equal to increase in their mobility leading up to their fall compared patients who did not fall at all during their length of stay. Following their fall patients capacity to move increases whereas how much they actually move decreases.

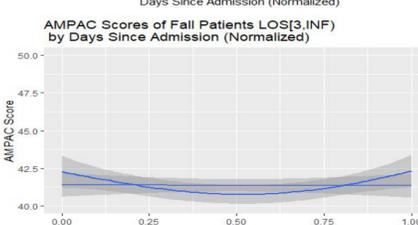
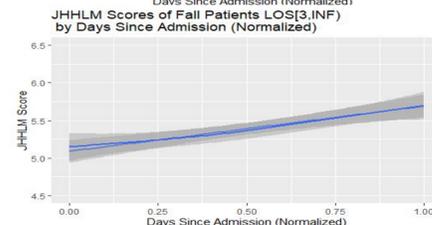
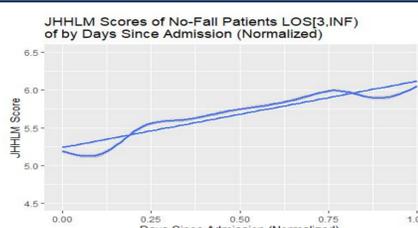
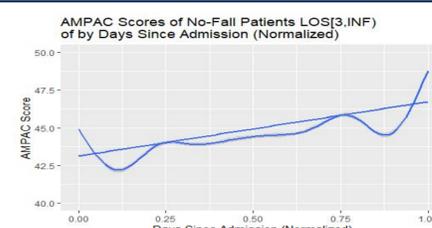


Figure 3 - Mobility Trends for Faller vs Non-Faller Patients

Figure 3 captures both linear and regional slopes of mobility scores over the duration of a patient's stay for both no-fall and fall patients. For both metrics, no fall patients improved over their stay, with fluctuations both right after admit and right before discharge. Fall patients' JH-HLM scores generally improve slightly over their stay, with a dip during the middle of their stay, similar to the AM-PAC, but not as profound. Indicates no fall patients' mobility has improved whereas fall patients have not over their length of stay.

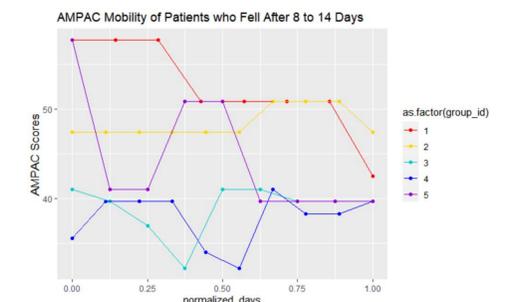


Figure 4 - Mobility Scores Before First Fall for 5 Patients with Intermediate LOS before Fall

Patients with Intermediate LOS are patients who first fell after 8-14 days after admission, there are in total 50 patients within this group and they represent 25% of all patients with falls. Here we randomly selected five patients and visualized their mobility trajectories before their first falls. The X-axis is normalized from 0 to 1, 0 is the day of admission and 1 is the date of injurious fall. As shown, falls seem to occur either 1) just as mobility is increasing after a drop or 2) at the end of a drop in mobility before it begins to rise.

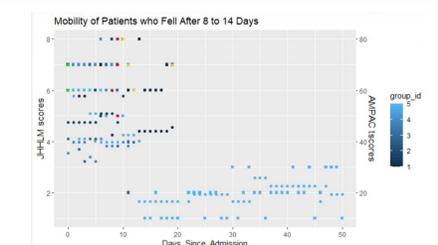


Figure 5 - Mobility Scores Throughout LOS for 5 Patients with Intermediate LOS before Fall

Here we randomly selected five patients with Intermediate LOS and visualized their mobility trajectories from admission to discharge. The X-axis represents days since admission, not normalized. For discrete points, red points indicate where falls occurred, green points indicate dates of admission and yellow points indicate date of discharge; furthermore, the squares are JHHLM scores and circles are AMPAC scores.

Conclusion

Hospital patient falls appear to have important associations with mobility (Figure 3). Patients are less mobile than non-fallers and are less mobile around the time of their fall. Changes in mobility could be an important predictor of hospital patient falls