Scientific Research Publishing

Open Journal of Therapy and Rehabilitation, 2024, 12, 52-60
https://www.scirp.org/journal/ojtr
ISSN Online: 2332-1830
ISSN Print: 2332-1822

Improvement in Patient Mobility Following Short-Term Rehabilitation in Skilled Nursing Facilities

Sean R. Silver*, Jaden A. Silver

Samueli School of Engineering, University of California, Los Angeles, USA
Email: *seanrileysilver@gmail.com

How to cite this paper: Silver, S.R. and Silver, J.A. (2024) Improvement in Patient Mobility Following Short-Term Rehabilitation in Skilled Nursing Facilities. *Open Journal of Therapy and Rehabilitation*, **12**, 52-60.
https://doi.org/10.4236/ojtr.2024.121005

Received: December 31, 2023
Accepted: February 5, 2024
Published: February 8, 2024

Abstract

Background: Mobility in older adults can be impaired after acute illness or hospitalization, and the level of severity can be used as a predictor of one's ability to return to independent living. Patients are often referred to skilled nursing facilities in hopes of improving their mobility. We wanted to prove that rehabilitative services at Skilled Nursing Facilities improve overall outcomes. **Methods:** We conducted a retrospective analysis of data from 4612 patients admitted for short-term rehabilitation in a large nursing home chain in California. Our aim was to determine whether patients' mobility scores, as measured by rehabilitative staff, significantly improved by time of discharge compared to their scores at admission. Mobility scores were rated from 1 to 6, with 1 being the most dependent on aid and 6 being the most independent, over a variety of tasks at admission and compared to scores at discharge. Pearson's correlations were performed to determine if there were significant relationships in the data: the Pearson's correlation coefficient was used to describe the relationships between patient admission to a skilled nursing facility and medical improvement upon discharge. **Results:** The study demonstrated a statistically significant improvement in patients' mobility scores upon discharge, with Medicare insured patients showing on average 57% improvement and Managed Care insured patients showing on average 59% improvement. Additionally, admission scores appeared to be predictive of the patient's outcome at discharge. **Conclusions:** The values and consistency of improvement support the use of acute rehabilitative services in skilled nursing facilities. An equation can be formulated that evaluates patients' estimated mobility statuses upon discharge from facilities based on their conditions on their arrivals. With this, new interventions can be studied and compared to the current standard of care by using these measurements. They can determine if further improvements can be made to increase patient outcomes.

Keywords

Mobility, Skilled Nursing Facility, Rehabilitative Services, Independent Living, Healthcare

1. Introduction

Older adult patients who suffer acute illness or undergo major surgery can have a marked reduction in physical independence. Often to help patients recover function, they will be admitted to a skilled nursing facility where they can receive intensive physical, occupational, and speech therapy. Overall, patients appear to improve, but the magnitude of improvement is not well quantified. Few studies have adequately reviewed this on a large scale [1] [2] [3] [4]. Skilled nursing facilities play an ever increasing role in the rehabilitation of patients. Acute care hospitals are discharging patients quicker with higher medical acuity, while hospitals are attempting to find more cost effective methods for recovery than acute rehabilitation hospitals. Skilled nursing facilities tend to adapt to sicker populations while dealing with increasingly limited resources.

Previous studies explored the role of rehabilitation in improving function and mortality in Skilled nursing facilities [5] [6] [7], both in general and following hip fracture. A more recent study, however, stated that physical and occupational therapy did not improve overall function regardless of whether or not the patient was diagnosed with dementia [8]. We believe that it is more likely that rehabilitative services at skilled nursing facilities do improve overall outcomes.

One of the key factors that impacts independence is mobility. Patients' mobility can be reviewed upon admission and discharge to determine if, and to what degree, mobility has improved. A baseline of average improvement in terms of patients' overall growth in the field of mobility is a key component to determine the level of independence patients will achieve. This is critical for patients and families to plan whether assistance will be needed following the skilled nursing stay as well as the extent of such assistance. Additionally, skilled nursing facilities are able to use such information to build a working knowledge of how to improve services provided. Patients can see their improvement and spend their most optimal amount of time in a facility, expecting specific adjustments to their mobility and ability to function independently after discharge from the facility. There were no found, established objective predictors regarding patients' expected level of progress. This objective data would be helpful for patients and families of patients to plan for the patient's discharge needs, and it will play a role in improving healthcare in skilled nursing facilities.

2. Methods

Mobility is valued on a rehabilitation score range of 1 to 6, one being heavily dependent and six being highly independent (higher scores, *i.e.* scores above 6,

are reserved by practitioners for missed assessment periods, refusal/failure to comply with the tasks, safety concerns, or other similar means). Scores are assigned based on specific tasks or objectives being met. The lower the score, the worse the level of function equating to a higher level of dependence. For example, tests include walking a specific distance, rolling left and right, standing up, lying down, sitting up, and moving onto a toilet, onto a chair, or into a car. This scoring system was utilized throughout 75 different healthcare facilities in California to monitor progress with therapeutic inventions. All patients included were in the Patient Driven Payment Model (PDPM) system, which encompasses Medicare and most Managed Care patients [9]. Administrators of these scores give each patient of the facility as much independence as possible to ensure impartial judgment and improvement among the patients. With scores observed from multiple facilities, a proper prediction of improvement for a patient in the field of mobility can be determined from admission for discharge [10] [11]. Patients received a combination of physical, occupational and/or speech therapy depending on their diagnosis and degree of disability. Frequency and duration of therapy was determined by a facility's rehabilitation team.

Using the scores provided, a Pearson's correlation was done to determine if there was a significant correlation between a patient's admission scores and their discharge scores in the data. Pearson's correlation coefficient ranges from −1 to +1, with −1 indicating the weakest correlation between the variables and +1 indicating the strongest correlation between the variables. A strong correlation begins at approximately 0.6 [12]. The values being correlated in this case are the scores of mobility when a patient is admitted to rehabilitation and the scores from when they are discharged from rehabilitation. Other values being correlated were the mobility scores at discharge from rehabilitation. A total of 3404 Medicare patients and 1208 Managed Care patients (**Table 1**) were studied

Table 1. Patient demographics.

Characteristic	Percent
Gender	
Male	51.80%
Female	48.20%
Diagnostic Category	
Medically Complex	40.70%
Orthopedic	22.30%
Neurological	14.80%
Respiratory	9.10%
Cardiac	8.50%
Cognitive	4.70%

*Average Age is 74.3.

retrospectively, looking at mobility scores comparing admission to discharge as well as the total amount of improvement each patient achieved at discharge from rehabilitation. The number of patients accounted for possible temporal biases in the data from singular patients and variability in the quality and range of rehabilitative services between facilities. Along with the correlation study, graphical trend lines were generated from the mobility data to determine the mean improvement by discharge. All these correlations can be used as predictors for an outcome of a mobility score.

3. Results

The mean mobility admission value for a Medicare resident is 32.1 and the mean mobility discharge value is 50.5. The average percent change for a Medicare resident is 57.37825%. The mean mobility change for a Medicare resident is 18.5. The mean mobility admission value for a Managed Care resident is 33 and the mean mobility discharge score is 52.6. The mean percent change for a Managed Care resident is 59.47432%. The mean mobility change for a Managed Care resident is 19.7. The difference between the outcomes of Managed Care and Medicare facilities are minimal, as represented by the graph of length of stay (Figure 1). The change showed a statistically significant improvement in mobility at discharge when compared to admission for all parameters reviewed based on Pearson's coefficient.

The mobility discharge value can be determined with the equation of "$y = 1.163x + 14.237$" for MGA (Managed Care) facilities' patients (Figure 2) and "$y = 1.2147x + 11.529$" for MCA (Medicare) facilities' patients (Figure 3), y being the mobility discharge value and x being the mobility admission value. These values can be used to determine the mean discharge score rate from a given starting admission score (reference Table 2 for examples).

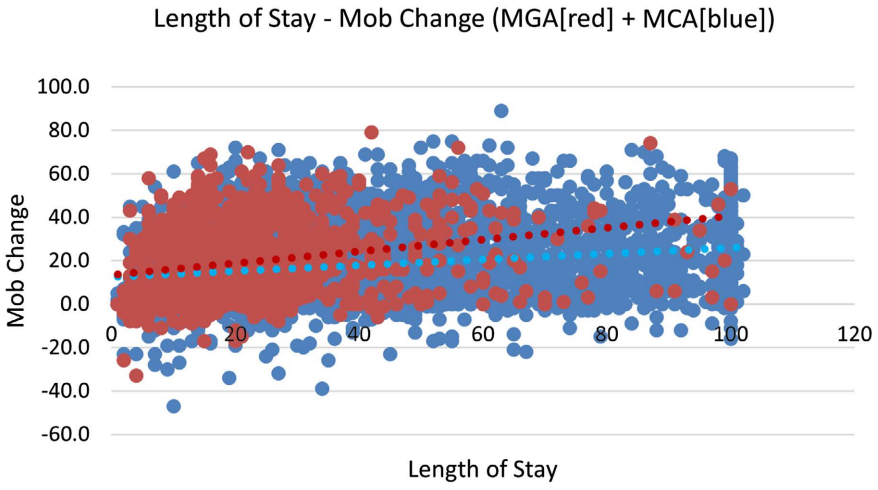

Figure 1. This compares patients' lengths of stays to the overall mobility changes of those patients. Both Managed Care (MGA) and Medicare (MCA) patients are represented in this chart.

Table 2. Examples of predictive admission to discharge scores.

	Managed Care*		Medicare**	
	Total Admission	Total Discharge	Total Admission	Total Discharge
Score	0	14.237	0	11.529
	5	20.052	5	17.602
	10	25.867	10	23.676
	25	43.312	25	41.896
	50	72.387	50	72.264
	100	130.537	100	132.999

*$y = 1.163x + 14.237$; **$y = 1.2147x + 11.529$.

For example, a patient upon admission requires about 50% physical assistance to move in bed, transfer (sit to stand), and walk about 150', however is unable (with maximal assistance) to walk on uneven surfaces nor negotiate a curb or steps would have a mobility score of roughly 33. Using the formula y (improvement) = 1.2147x (baseline mobility score) + 11.529, we can reasonably expect the discharge mobility score to be about 52. A score of 52 would present as the patient being able to move in bed, transfer and walk at least 150' with supervision only, as well as being able to negotiate a curb with 25% or less physical assistance and negotiate 4 steps with 25% to 50% assistance.

4. Discussion

The study clearly demonstrates significant improvement with short-term rehabilitative services for residents admitted to skilled nursing facilities. The data was similar regardless of insurance status. This information is useful to patients, caregivers, patients' families, and therapists so that they can start preparing for a potential discharge and make suitable arrangements.

With the similarity of the graphs between multiple facilities, which helps remove statistical miscalculations and biases, and the positive Pearson's correlation scores, the data for these values are positively correlated. With this information, we can predict the level of function at the time of discharge within a certain range, defined by the offsets above (+20) and below (−10) the trend line (**Figure 4** and **Figure 5**). Additionally, as depicted on the graphs of **Figure 2** and **Figure 3** (mobility admission vs mobility discharge), based on specific points on the trend line there, certain outcomes can be diagnosed as the particular mobility scores upon exiting the facility. It is possible to determine the average likelihood of improvement by using this graph by correlating a specific admission point and revealing its relative discharge point on the y-axis. The offset for this is about −10 (decreasing to −20 the higher the admission score is) and +20 (decreasing to +10 the higher the admission score is). With the trend lines in the graphs (**Figures 2-5**), an average expectancy of discharge and overall change scores can be predicted for patients in the facilities.

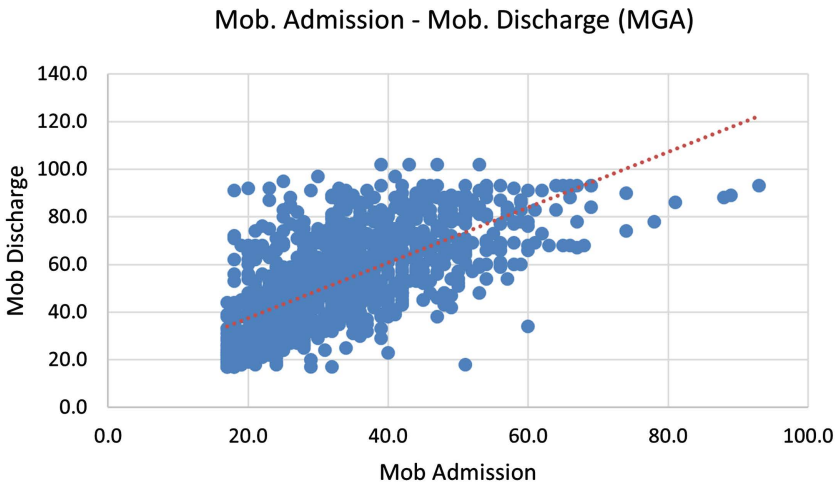

Figure 2. This compares mobility on admission to mobility on discharge for Managed Care (MGA) patients.

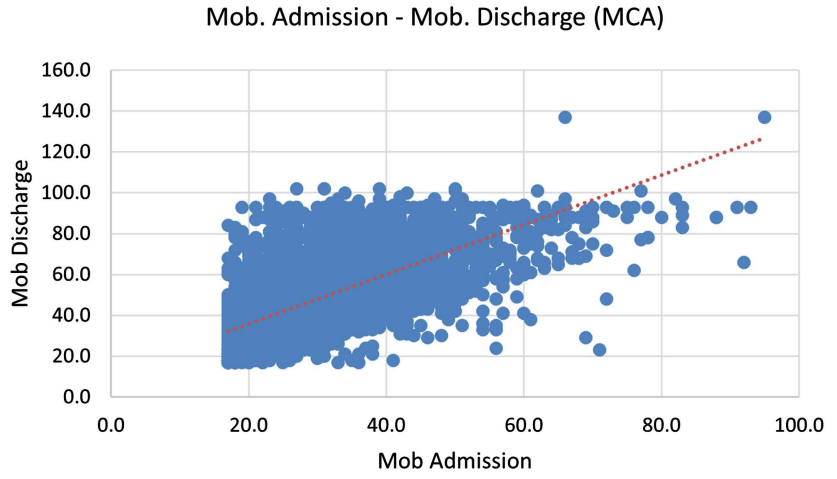

Figure 3. This compares mobility on admission to mobility on discharge for Medicare (MCA) patients.

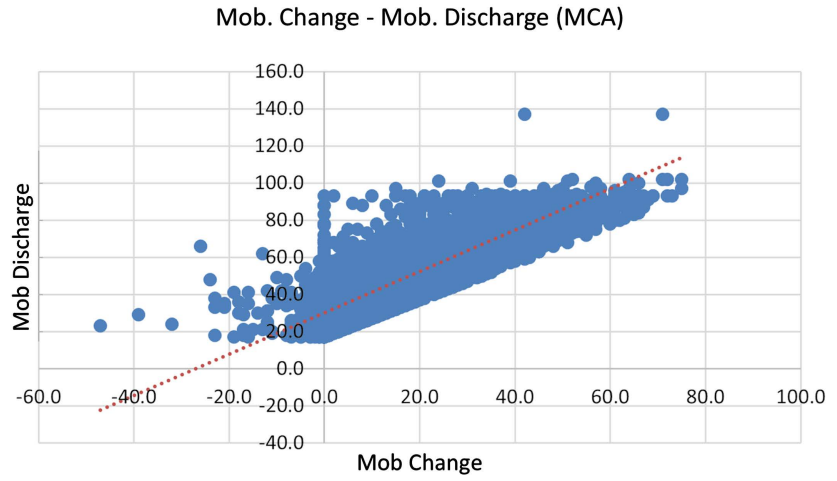

Figure 4. This compares mobility's overall change to mobility on discharge for Medicare (MCA) patients.

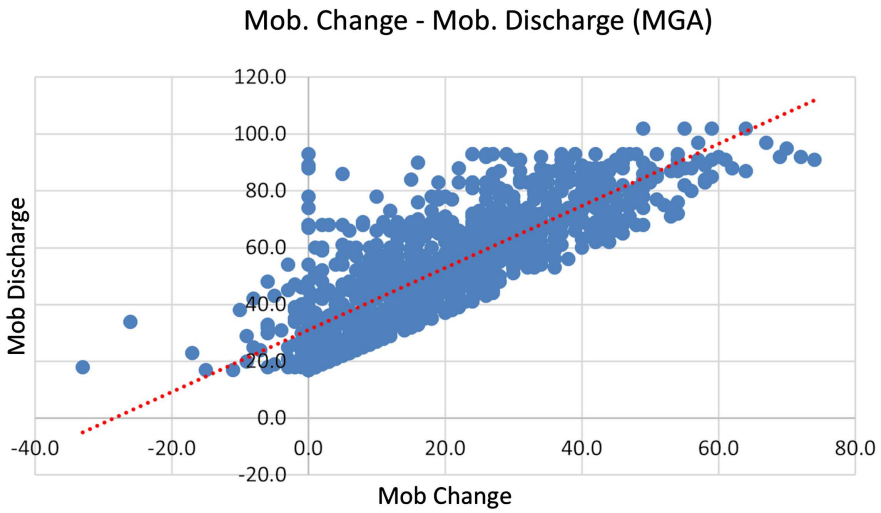

Figure 5. This compares mobility's overall change to mobility on discharge for Managed Care (MGA) patients.

A score for admission can be used to create an estimated outcome of improvement upon exiting a skilled nursing facility. The study clearly demonstrated that both Medicare and Managed Care patients showed statistically significant improvement in mobility as a result of the rehabilitative services. In fact, a certain value of improvement can be expected upon the discharge of a patient from the facility. This knowledge benefits facilities in allowing them to determine the best objectives to reach a specific expectancy of improvement scores. By studying new modalities, the model can help determine if interventions resulted in greater overall improvement. If facilities can raise the trend lines' averages and implement these methods widely, it can lead to even greater improvement. Additionally, patients of these facilities are given some sort of expectancy of improvement and satisfaction for their care. Patients can plan for their future, knowing what probable percentage of assistance they will need in their daily lives (such as walking long distances) and what they may be able to do safely after being discharged from a facility. With a mean of where a patient should be when discharged, a time for when the best applicable discharge can be optimized. An expected outcome can lead to an earlier discharge if no better mobility is to be expected and resources and facilities can be freed up sooner for newer patients in a time of necessity. Further research can go into an average of a length of stay until discharge, specific groups' recoverability (such as people with hip replacements), or ADL scores' correlations ("activities of daily living" scores based on independence in tasks other than mobility, such as patients brushing their teeth) [13]. Future research can help determine if factors such as age, psychiatric influences, and chronic and non-chronic conditions affect improvement in skilled nursing facilities.

5. Conclusion

The study supports the use of rehabilitative services in skilled nursing facilities

as a viable and important tool to allow patients to return to their premorbid level of function, or at least something closer to it. Their improved mobility allows patients to avoid an unexpected, sudden necessity of social isolation after hospitalization or severe illness. Patients are able to return to their personal lives at home and require a lower level of supportive services.

Data

MCA Pearson's Correlation:
Mob. Admission to Mob. Discharge: 0.671182 (**Figure 3**).
Mob. Change to Mob. Discharge and Vice Versa: 0.836793 (**Figure 4**).
MGA Pearson's Correlation Score:
Mob. Admission to Mob. Discharge: 0.669818 (**Figure 2**).
Mob. Change to Mob. Discharge and Vice Versa: 0.817436 (**Figure 5**).

Acknowledgements

We would like to acknowledge Alla Onitskansky, Lee Westover, and Julia Gonzalez for their outstanding contributions to this paper, which include general administrative support, data collection, and technical editing. We would also like to acknowledge Pacific Healthcare, who provided the data for this analysis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Prusynski, R.A., Gustavson, A.M., Shrivastav, S.R. and Mroz, T.M. (2021) Rehabilitation Intensity and Patient Outcomes in Skilled Nursing Facilities in the United States: A Systematic Review. *Physical Therapy*, **101**, pzaa230. https://doi.org/10.1093/ptj/pzaa230

[2] Lenze, E.J., Lenard, E., Bland, M., *et al.* (2019) Effect of Enhanced Medical Rehabilitation on Functional Recovery in Older Adults Receiving Skilled Nursing Care after Acute Rehabilitation: A Randomized Clinical Trial. *JAMA Network Open*, **2**, e198199. https://doi.org/10.1001/jamanetworkopen.2019.8199

[3] Verweij, L., van de Korput, E., Daams, J.G., *et al.* (2019) Effects of Postacute Multidisciplinary Rehabilitation Including Exercise in Out-of-Hospital Settings in the Aged: Systematic Review and Meta-Analysis. *Archives of Physical Medicine and Rehabilitation,* **100**, 530-550. https://doi.org/10.1016/j.apmr.2018.05.010

[4] Casertano, L.O., Bassile, C.C., Pfeffer J.S., *et al.* (2022) Utility of the AM-PAC "6 Clicks" Basic Mobility and Daily Activity Short Forms to Determine Discharge Destination in an Acute Stroke Population. *The American Journal of Occupational Therapy*, **76**, No. 4. https://doi.org/10.5014/ajot.2022.047381

[5] Arling, G., Williams, A.R. and Kopp, D. (2000) Therapy Use and Discharge Outcomes for Elderly Nursing Home Residents. *The Gerontologist*, **40**, 587-595. https://doi.org/10.1093/geront/40.5.587

[6] Murray, P., Singer, M., Dawson, N.V., Thomas, C.L. and Cebul, RL. (2003) Outcomes of Rehabilitation Services for Nursing Home Residents. *Archives of Physical*

Medicine and Rehabilitation, **84**, 1129-1136.
https://doi.org/10.1016/S0003-9993(03)00149-7

[7] Downer, B., Reistetter, T.A., Kuo, Y.F., Li, S., Karmarkar, A., Hong, I., Goodwin, J.S. and Ottenbacher, K.J. (2021) Relationship between Nursing Home Compare Improvement in Function Quality Measure and Physical Recovery after Hip Replacement. *Archives of Physical Medicine and Rehabilitation*, **102**, 1717-1728.e7.
https://doi.org/10.1016/j.apmr.2021.03.012

[8] Flanagan, J. and Boltz, M. (2023) Postacute Rehabilitation in Patients with and without Dementia. *Annals of Long-Term Care*.

[9] CMS. Cms.gov (2018) Patient Driven Payment Model.
https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/PDPM

[10] Kucienski, J.E. (2017) Improving Mobility for Older Adults in the Acute Rehabilitation Setting. PhD Thesis, University of Massachusetts Amherst, Amherst, 1-35.

[11] Kerber, K.A., Skolarus, L.E., Feng, C. and Burke, J.F. (2020) Validation of Medicare Rehabilitation Functional Assessments in Routine Care. *JAMA Network Open,* **3**, e204702. https://doi.org/10.1001/jamanetworkopen.2020.4702

[12] Mindrila, D. and Balentyne, P. (2017) Scatterplots and Correlation.
https://www.westga.edu/academics/research/vrc/assets/docs/scatterplots_and_correlation_notes.pdf

[13] van Dartel, D., Vermeer, M., Folbert, E.C., *et al.* (2021) Early Predictors for Discharge to Geriatric Rehabilitation after Hip Fracture Treatment of Older Patients. *Journal of the American Medical Directors Association*, **22**, 2454-2460.
https://doi.org/10.1016/j.jamda.2021.03.026