Predicting Rehabilitation Outcomes using Activity Measure for Post-Acute Care (AMPAC) Measures (PRO AM)

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Abstract

Background: Determining successful rehabilitation candidates is a multifaceted and largely qualitative task. Increasing financial pressures and a new focus on efficient healthcare resource utilization makes allocation of scarce rehabilitation resources an important focus of the consulting physiatry team. Finding a tool or quantitative score which can help predict patient outcomes is of utmost importance in the new age of value based medicine. Our study examines whether an objective measure of patients' functional status, while in acute care hospitals (i.e. the Activity Measure for Post-Acute Care [AMPAC] score), can predict their discharge outcome from acute rehabilitation and therefore assist the consulting physiatrist in recommending the most appropriate discharge disposition from acute care hospitals.

Study Design: Retrospective Chart Review

Methods: Chart review of all unique admissions to Penn Institute for Rehabilitation Medicine (PIRM) from 3/1/17 through 5/30/17. AMPAC mobility scores and AMPAC ADL scores were compared for patients who required an acute discharge from PIRM back to acute care hospital due to acute medical decompensation (Acute Out – AO) and patients who had a final discharge outcome to a skilled nursing facility (SNF) versus patients who had a final discharge outcome to home.

Results: Patients in the AO group and patients discharged to SNF had significantly lower AMPAC scores in acute care hospital compared to those who were discharged home.

Conclusions: AMPAC scores provide a significant quantitative measure that can be used to predict discharge outcomes of patients prior to admission to an inpatient rehabilitation facility (IRF).

Level of Evidence: III

Introduction

Identifying qualified and successful acute inpatient rehabilitation candidates is a comprehensive process. A vital role of the inpatient Physical Medicine and Rehabilitation (PM&R) consult team is to determine the most appropriate post-acute care (PAC) setting for a patient in the acute care facility based on their medical, functional, and social needs. PAC settings include acute rehabilitation facilities (ARF), subacute rehabilitation (SAR), skilled nursing facilities (SNF), home, and LTACH (long term acute care hospital). Key components of the disposition decision-making process include: diagnosis, medical stability, therapy tolerance, functional deficits, and functional prognosis. Additional considerations that are becoming increasingly more important are patient outcomes and healthcare resource utilization. As hospitals are being placed under increasing financial pressure to reduce readmissions in order to avoid loss of reimbursements, initiatives are being put in place to reduce undesirable outcomes.

Functional outcome measures vary across post-acute care settings. The Functional Independence Measurement (FIM) score is the most widely used functional scale for the inpatient setting. However, it has narrow scope of functional content and does not examine the execution of a broader range of tasks necessary to transition to a community setting[1,2] . Other functional outcome instruments used in different PAC settings include: Disability Rating Scale (DRS), minimum data set (MDS) for skilled nursing and subacute rehabilitation programs, Outcome and Assessment Information Set (OASIS) for Home Health Care, short form 36 (SF 36) for ambulatory settings[3,4,5]. The limitations of current functional assessment tools don't allow for predictability across the continuum of all levels of post-acute care as they are disease, condition, or setting-specific [6,7, 17, 18]. If the goal of post-acute care (PAC) is comprehensive

functional outcome assessment and quality monitoring for different patient diagnostic groups across different PAC settings for optimal outcomes, efforts are needed to develop functional outcome assessments that are applicable across a continuum of post-acute services and settings[1].

A functional instrument that has been shown to surmount the limitations of traditional functional outcome measures is the Activity Measurement for Post- Acute Care (AMPAC) [8]. It is a comprehensive assessment tool based on functional activities across three domains (Basic Mobility, Daily Activity, and Applied Cognitive) that are likely to be performed by most adult patients in inpatient and outpatient settings [9]. The reliability and validity of this instrument has been demonstrated amongst diverse patient populations across a variety of post-acute care settings [1, 10, 11]. It was shown to be accurate in predicting discharge destination based on the first therapy evaluation in acute care hospitals [11, 12]. Compared to the Functional Independence Measure (FIM), the AMPAC was found to have a higher sensitivity to both positive and negative changes in functional activity in patients admitted to an IRF [2]. The AMPAC appears to be a concise, comprehensive, and sensitive tool to measure post-acute care functional outcomes across diverse patient groups [13]. Because it has reportedly been used across different patient diagnoses, conditions, and settings it may be the ideal tool for assessing functional outcomes during the transition of a patient to post-acute care.

AM-PAC scores have not been evaluated in the acute care setting for predicting rehabilitation outcomes and successful discharges to home. This study will look at the predictive ability of AM-PAC scores on discharge outcomes from acute rehabilitation. In addition, the implementation of the AM-PAC scores as a valid predictive tool to be utilized by PM&R consultant teams when providing recommendations to acute care teams ARF appropriateness, specifically in the University of Pennsylvania Health System (UPHS) will also be assessed. We hypothesize that using the AM-PAC will predict long term and post-ARF outcomes. Having a valid predictive tool will allow consulting teams and acute care therapists to make better guided decisions on rehabilitation discharge disposition. By identifying critical values within AM-PAC grading we plan to determine a valid tool for SNF, ARF, and home discharge recommendations.

Materials and Methods

The UPHS electronic medical record was queried to obtain all unique admissions to the Penn Institute of Rehabilitation Medicine (PIRM) inpatient rehabilitation hospital from 3/1/2017 to 5/30/2017 (n = 293). Each admission was treated as a unique encounter during this time period even if the same patient was admitted multiple times. Patients who had an interrupted stay (less than 48 hours in acute care or ED) due to need of a diagnostic modality unavailable at PIRM or need for procedure not performed at PIRM, but did not require a complete discharge and readmission had their final disposition recorded as discharge outcome.

The inclusion criteria for this study was a patient being admitted to PIRM during the examined time period. The exclusion criteria were having incomplete or unavailable AM-PAC score data from the acute care hospital and incomplete or unavailable discharge outcome. No diagnoses or demographic information were used to exclude patients. After the initial cohort of unique encounters were identified (n = 293) it was found that 240 unique encounters met study inclusion and exclusion criteria.

Patient records were reviewed for age, gender, diagnosis, AM-PAC mobility scores, AMPAC ADL scores, AMPAC and final discharge outcome. AMPAC mobility and AMPAC ADL scores were then summed to record a total AMPAC score. Any protected personal health information (PHI) was discarded. Each of these data points were recorded on a HIPAA compliant computer drive and all data analysis was performed on de-identified data on a HIPAA compliant computer system.

MiniTab 18.1 software package [14] was used for all statistical analysis and data interpretation. As no current studies have established guidelines for AMPAC scores as predictive tools for discharge from acute rehabilitation we established a median AMPAC score and compared the top fiftieth percentile against the lower fiftieth percentile for outcome measures to identify outcome rates. For further analysis, data were grouped according to discharge outcome (Acute Out and SNF versus Home) and AMPAC scores were calculated and compared between the two groups.

Results

Demographic data was collected from the patient population and revealed an average age of 61.28 years of age (standard deviation of 14.92 years) and a gender compisition of 143 (59.58%) males and 97 (40.42%) females. Diagnoses were grouped based on inpatient rehabilitation Medicare diagnoses plus two common patient populations seen at PIRM – organ transplant and medically complex patients [15]. In order of most frequent primary admission diagnosis to least frequent: Stroke/CVA (53 – 22.08%), TBI (41 – 17.08%), medically complex (36 – 15.00%), total joint replacement (31 – 12.92 %), SCI (27 -11.25%), organ transplant (22 – 9.17%), neurologic disorder (17 – 7.08%), amputation (8 – 3.33%), and multiple major trauma (5 – 2.08%) (Table 1).

Patients who required an acute discharge from PIRM back to acute care hospital due to acute medical decompensation (Acute Out – AO) and patients who had a final discharge outcome to a skilled nursing facility (SNF) had very highly significant ($p = < .001$) lower AMPAC scores in acute care hospital compared to those with a final discharge outcome to home.

Analysis of the 240 unique patient encounters revealed that there were a total of 140 discharges to home (58.33%), 38 discharges to SNF (15.83%), and 62 patients with a discharge to acute care hospital for acute medical decompensation (AO) (25.83%). The mean total AMPAC score from acute care hospital for home discharge cohort was 33.07 with a standard deviation of 5.83. The average total AMPAC score for the SNF and AO cohorts at 24.21 (standard deviation of 5.37) and 26.47 (standard deviation of 6.97) respectively, were similar.

An ANOVA test was then performed to examine the difference between the Home, AO, and SNF groups which revealed there is a very highly significant ($p = < .001$) difference between at least one group in the study (Table 2). Tukey's and Fischer's tests showed that the Home discharge group differed significantly from both the AO and SNF discharge groups (Table 3, Figure 2).

To identify patients which were more likely to have a poor outcome (AO or SNF final discharge), we combined the AO and SNF groups (AO+SNF) for further analysis which revealed a combined average AM-PAC score of 25.61 (standard deviation of 6.48). This combined group was then compared with the Home discharge group AM-PAC score of 33.07 (standard deviation 5.83) with a paired t-test which

revealed a significant difference in AM-PAC score between the AO+SNF discharge group and the home discharge group ($p < .001$; Difference = -7.460; CI 95% -9.065, -5.855) (Table 4).

The median AMPAC Total value was then found of the 240 unique admissions – which was found to be 30. Admissions with an AMPAC Total of greater than or equal to 30 (n = 122) had an 81.15% chance of discharge to home, while those with an AMPAC Total score of 29 or less had a 34.75% chance of discharge home. A Chi Squared test revealed a significant difference between these groups and the rate of discharge to home ($p = <0.0001$) (Table 5).

Discussion

One of the main roles of the consultant physiatrist in determining the appropriate post-acute care discharge destination is appraising multiple qualitative factors: medical stability, rehabilitation goals, expected rehabilitation outcomes, outpatient and community social support and third party payers (insurance). The AMPAC is an objective tool that can be used to measure functional status in the inpatient setting. Our study aimed to test the ability of the acute hospital AMPAC score to predict discharge outcomes from acute rehabilitation. Our results show that higher acute care AMPAC scores were associated with discharge to home from acute rehabilitation and low scores were associated with discharge to SNF or acute send out back to acute care (Figure 1). Patients with AMPAC Total scores greater than or equal to 30 were more likely to be discharged home compared to those with scores of 29 or less (Table 5)

These findings are consistent with other studies that have shown the predictive ability of the acute care AMPAC score in determining discharge outcomes from acute care [11, 12]. In this study we found that a patient's acute care AMPAC scores are an accurate predictor of post-IRF discharge outcome. The AMPAC can potentially be used by PM&R consult services in acute care to determine the most appropriate discharge destination for patients before they are admitted to IRF. The use of AMPAC in this way would improve health resource utilization by decreasing the number of patients admitted to IRF who are unlikely to have a positive outcome.

In a political and economic climate where healthcare resource utilization is at the forefront, it is imperative to consider the value of the services we provide. The use of a tool as simple as the AMPAC in selecting the most appropriate patients for IRF admission has the potential to improve outcomes while decreasing cost of care for patients who would be better served at a subacute level. One of the main strengths of IRFs compared to SNFs is that IRF patients have more favorable discharge outcomes: The Centers for Medicare & Medicaid Services (CMS) has previously reported that when compared to SNFs, IRFs have a much higher rate of discharging patients to the community (IRFs: 81%; SNFs: 46%); and much lower acute hospital readmission rates (IRF: 9.4%; SNF: 22.0%) [16]. Nevertheless, IRFs have faced scrutiny from Congress and CMS in the recent past, leading to strict criteria for IRF patients, payment cuts and other policy restrictions. It is therefore all the more important to carefully select patients for IRF admission who have a higher probability of benefiting from IRF. We have shown that the quick, user friendly AMPAC score could be used as a tool to provide a more accurate picture of patient function and appropriateness for acute rehabilitation admission.

Our study may be limited by factors beyond AMPAC that are difficult to quantify and/or control that influence post-IRF discharge outcome. For example, patients' access to social support is difficult to glean from the medical record and plays an important factor in discharge to the community for many rehabilitation candidates. Additionally, our study data did not include measures of applied cognition, which can also impact discharge outcome but are not routinely measured as part of the AMPAC scoring in our hospital system. Our study data also did not include information on whether patients were admitted to acute care from home or SNF, which could also influence post-IRF discharge and recovery outcomes. However, we estimate the effect of the latter in our study to be small since few patients at a SNF level of care would be admitted to IRF from acute care hospitals. We note, however, that at least in a study of stroke patients, functional scores after admission to acute care hospital were the best predictors of discharge outcome when compared to factors such as age, sex and pre-admission functional measures [7]. Perhaps function during acute care hospitalization (as measured for example by acute care AMPAC) is a stronger outcome predictor than the multitude of other factors.

The AMPAC scoring tool is a validated, effective and efficient scoring tool that is accessible to multiple members of the healthcare team. Patients' acute care AMPAC scores can be an accurate and useful predictor for discharge outcomes from acute rehabilitation facilities. PM&R consultants in acute care can utilize this knowledge to make more informed and evidence-based disposition recommendations. They could also use this tool to advocate for functional optimization in the acute care setting prior to acute rehabilitation admission.

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Table 1

Diagnosis	Total	Percentage
TBI	41	**17.08%**
SCI	27	**11.25%**
CVA	53	**22.08%**
Amp	8	**3.33%**
MMT	5	**2.08%**
TJR	31	**12.92%**
Deform	0	
Neuro	17	**7.08%**
HFX	0	
PAA	0	
Vasc JI	0	
OA	0	
Burn	0	
Transplant	22	**9.17%**
Med Complex	36	**15.00%**
		100.00%
AGE		61.288
MALE		143.000
FEMALE		97.000

Table 2.

One-way ANOVA: Acute Care AM-PAC Total versus Outcome

Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	α = 0.05

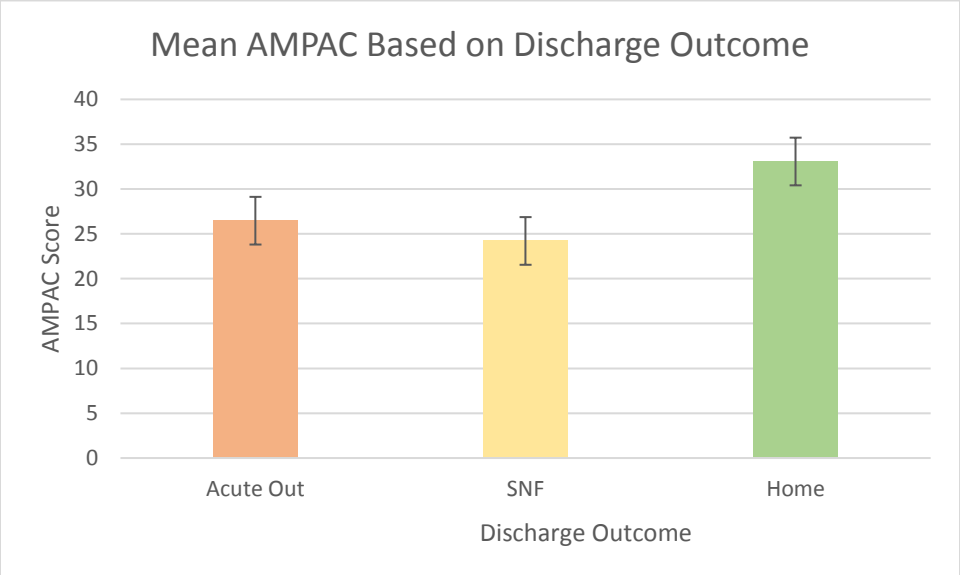
Means

Outcome	N	Mean	Standard Deviation	95% CI
Acute Out	62	26.468	6.972	(24.947, 27.989)
SNF	38	24.211	5.373	(22.268, 26.153)
Home	140	33.071	5.829	(32.059, 34.084)

Analysis of Variance

Source	Degrees of Freedom	Adjusted Sum of Squares	Adjusted Mean Square	F Value	P Value
Outcome	2	3368	1683.81	45.57	<0.0001
Error	237	8757	36.95		
Total	239	12125			

Figure 1.



Evaluation of the mean and standard deviations of the total AMPAC scores of the three discharge outcome groups: Acute Out (26.648 +/- 6.972), SNF (24.211 +/- 5.373), and Home (33.071 +/- 5.829).

Table 3.

Tukey Pairwise Comparisons

Grouping Information Using the Tukey Method and 95% Confidence

Outcome	N	Mean
Home	140	33.071*
Acute Out	62	26.468
SNF	38	24.211

*** Indicates mean is significantly different.**

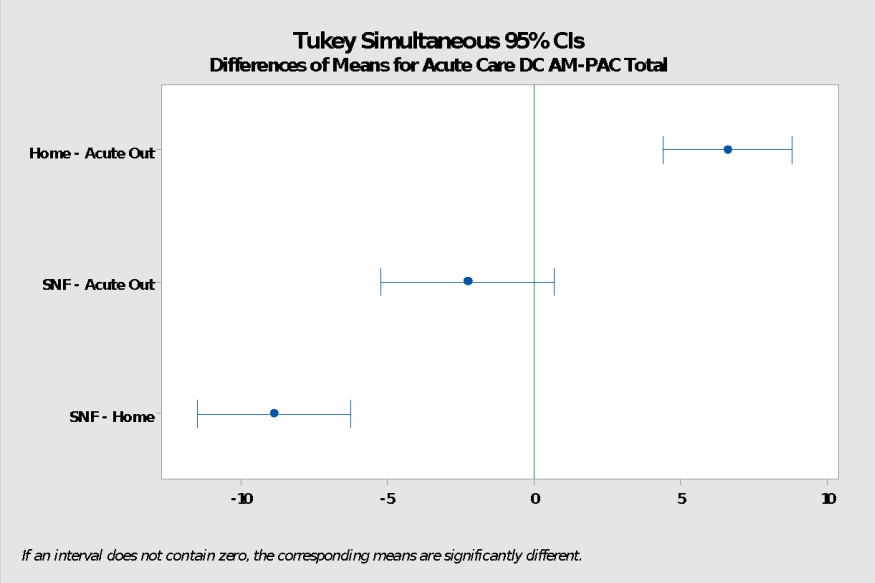
Fisher Pairwise Comparisons

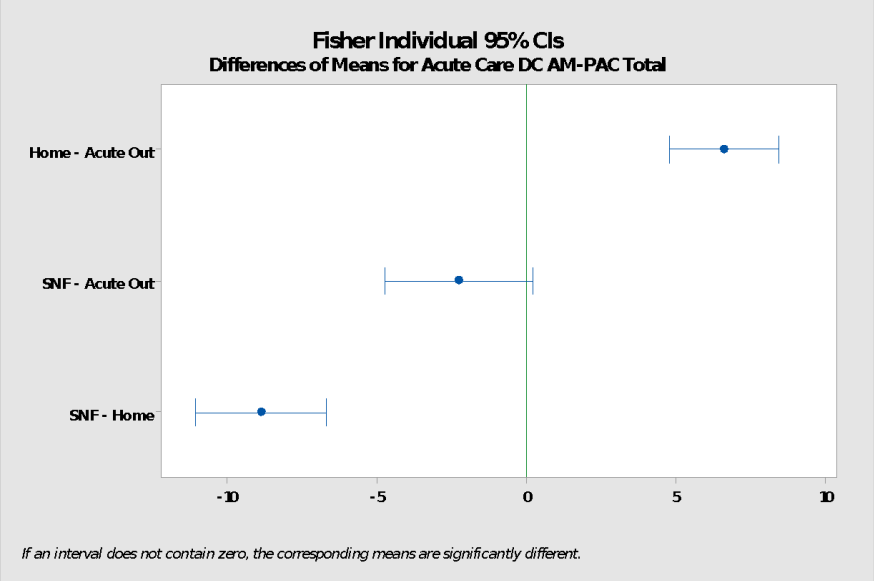
Grouping Information Using the Fisher LSD Method and 95% Confidence

Outcome	N	Mean
Home	140	33.071*
Acute Out	62	26.468
SNF	38	24.211

*** Indicates mean is significantly different.**

Figure 2 - Tukey and Fisher Tests.





Graphical representation of both the Tukey's and Fisher comparison of means. Each graph reveals that the SNF-Acute Out means are not significantly different from each otheras the confidence interval contains zero. In comparison, the difference between Acute Out-Home and SNF-Home are both significantly different.

Table 4.

Mean and Standard Deviation Comparison of AO+SNF versus Home Discharge

Sample	N	Mean	Std. Dev.	SE Mean
AO+SNF	100	25.61	6.48	0.65
Home	140	33.07	5.83	0.49

Estimation for Difference

Difference	95% CI for Difference
-7.460	(-9.065, -5.855)

T-Test

Null hypothesis H0: $\mu 1 - \mu_2 = 0$

Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
-9.16	199	0.000

Table 5.

Chi-Square Test for Association: AMPAC >= 30 versus AMPAC <= 29

	Home	AO+SNF	All
AMPAC >= 30	99	23	122
AMPAC <= 29	41	77	118
All	140	100	240

Chi-Square Test

	Chi Square	Degrees of Freedom	P-Value
Pearson	53.137	1	<0.0001
Likelihood Ratio	55.475	1	<0.0001