David West
Computer Integrated Surgery II
Group 11: ReHAP
Mentors: Dr. Krishnaj Gourab, Michael Cohen, Gorkem Sevinc, , John Adamovich

Seminar Review of:

Validity of the AM-PAC "6-Clicks" Inpatient Daily Activity and Basic Mobility Short Forms

Diane U. Jette, Mary Stilphen, Vinoth K. Ranganathan, Sandra D. Passek,
Frederick S. Frost, Alan M. Jette

Project Background

ReHAP is a decision support system for patient rehabilitation teams. The software employs algorithms that help physical and occupational therapists use patient prioritization factors to optimize care. The software is intended to be used by therapy teams at Johns Hopkins Bayview, NYU, and other beta testing institutions in the summer of 2016.

Motivation and Significance of AMPAC Scores in Patient Rehabilitation

ReHAP software employs prioritization algorithms that order and sort patients in a therapy case workload according to multiple factors. In summary, the algorithms primarily consider

- Unit – where the patient is in a hospital
- Lag Time – when a patient was last seen
- Mobility – the performance of a patient

Patients are sorted into categories based first on units, then sub-categories based on lag time. For example, patients with a lag time approaching a threshold (usually 3 days) and over a threshold are sorted into sub-categories. Within those sub-categories, patients are ordered by mobility. Moreover, the algorithm considers patients with high mobility and low lag-time as being over-seen or ready for discharge. Furthermore, some patients with low mobility and high lag-time will be flagged.

Ultimately, the algorithm is highly dependent on ability to measure patient performance. The AMPAC score, or Activity Measure for Post Acute Care, has become widely implemented system in major hospitals in the US in recent years. Developed by researchers at Boston University, the system seeks to standardize mobility assessment in post-acute settings, though is widely used in acute settings as well. At Johns Hopkins and other hospitals, AMPAC Scores are tracked in electronic medical records. Thus, ReHAP algorithms wil leverage AMPAC scores as the sole factor for patient performance. The study being considered sought to provide evidence for the validity of AMPAC scores in acute settings.

AMPAC Score Overview

Physical therapists and occupational therapists complete AMPAC scores for a patient on every visit. In both acute and post-acute settings, patients ofen receive a visits multiple times between admission and discharge, usually every 1-3 days. There are two AMPAC scoring systems – one for PT ("Basic Mobility") and one for OT ("Daily Activity"). The scores consider different criteria, but are identical in form. The "6-Click" AMPAC score is simple

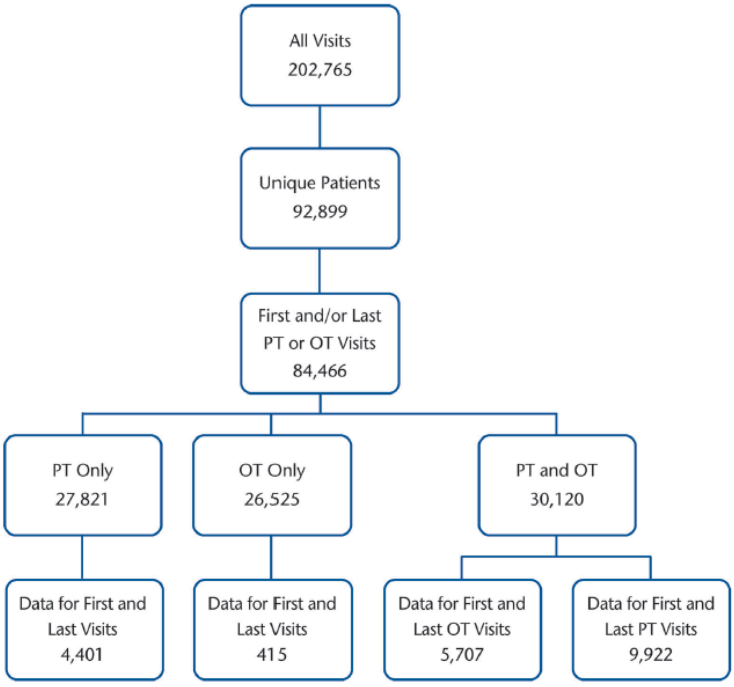
and quick to complete, as it involves only six small assessments. Each AMPAC score is a composite of scores on these six assessments, each scored from 1-4. Thus, AMPAC scores range from 6-24.

Please check the box that reflects your (the patient's) best answer to each question.	Unable	A Lot	A Little	None
How much help from another person does the patient currently need . . .				
1. Putting on and taking off regular lower body clothing?	☐1	☐2	☐3	☐4
2. Bathing (including washing, rinsing, drying)?	☐1	☐2	☐3	☐4
3. Toileting, which includes using toilet, bedpan, or urinal?	☐1	☐2	☐3	☐4
4. Putting on and taking off regular upper body clothing?	☐1	☐2	☐3	☐4
5. Taking care of personal grooming such as brushing teeth?	☐1	☐2	☐3	☐4
6. Eating meals?	☐1	☐2	☐3	☐4

Clinicians may find the following helpful in selecting responses:
1. Unable=Total/Dependent Assist
2. A Lot=Maximum/Moderate Assist
3. A Little=Minimum/Contact Guard Assist/Supervision
4. None=Modified Independence/Independent

(Figure: Daily Activity "6-click" AMPAC form. AMPAC is a trademark of Boston University.)

Overview of Experiment Data



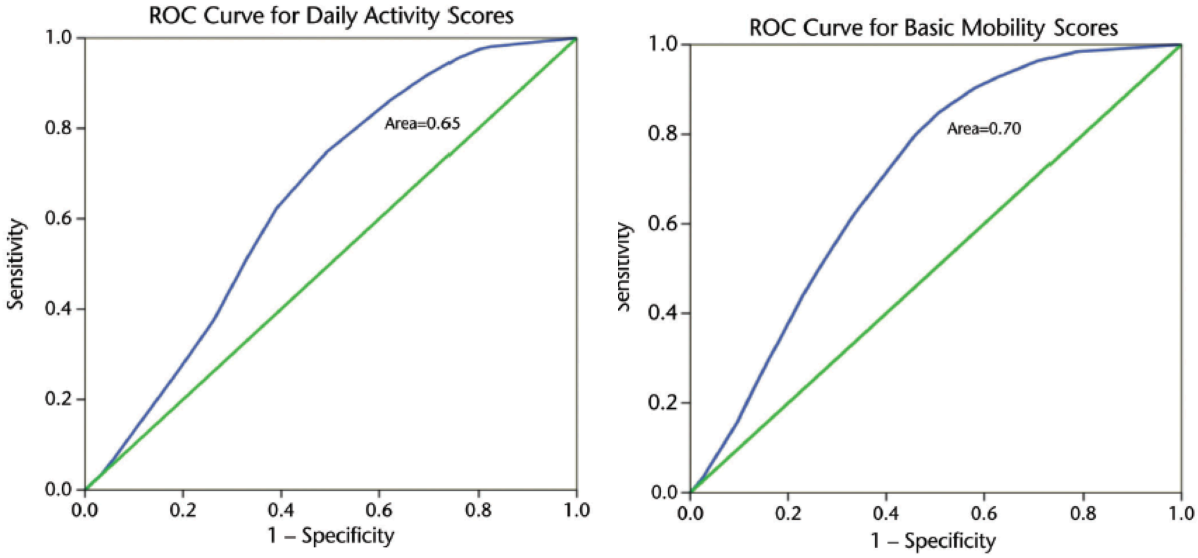
The study was retrospective, and used data from the Cleveland Clinic EMR system. The study only considered records that contained the 6-Click AMPAC score and both the patient's first and last visit. The data also contained the patient's age, primary medical or surgical condition, and preadmission living situation. Analysis was performed independently on OT and PT groups. There were a total of 6,122 OT patients and 14,323 PT patients that fit the criteria, and thus used to evaluate Basic Mobility and Daily Activity AMPAC scores respectively. Some of the data also included FIM score (n=170 and n=192 for Basic Mobility and Daily Activity respectively). This FIM, or Functional Independence Measure, is another standard measure for evaluating patient performance in rehabilitation. It includes 18 items scored from 1-7 each. This test is substantially more time-consuming to perform. Thus, it is of interest for ReHAP to understand the correlation between FIM and AMPAC. The small sample size for FIM is due

to the fact that it was measured only for patients admitted to the inpatient rehabilitation facility in the Cleveland Clinic.

Analysis and Results

Jette et al first examine possible ceiling and floor effect by examining the distribution of the scores from the first and final visit. While the study does not consider rater reliability, this does give some indication as to whether there is bias in the test or if the scale of the test is not properly set. The lowest score was given for 2.7% and 2.3% of patients, and the highest score was given for 15.5% and 10.1% of patients in the Basic Mobility and daily activities respectively. Clearly, there is a tendancy to rank patients at the top of the scale.

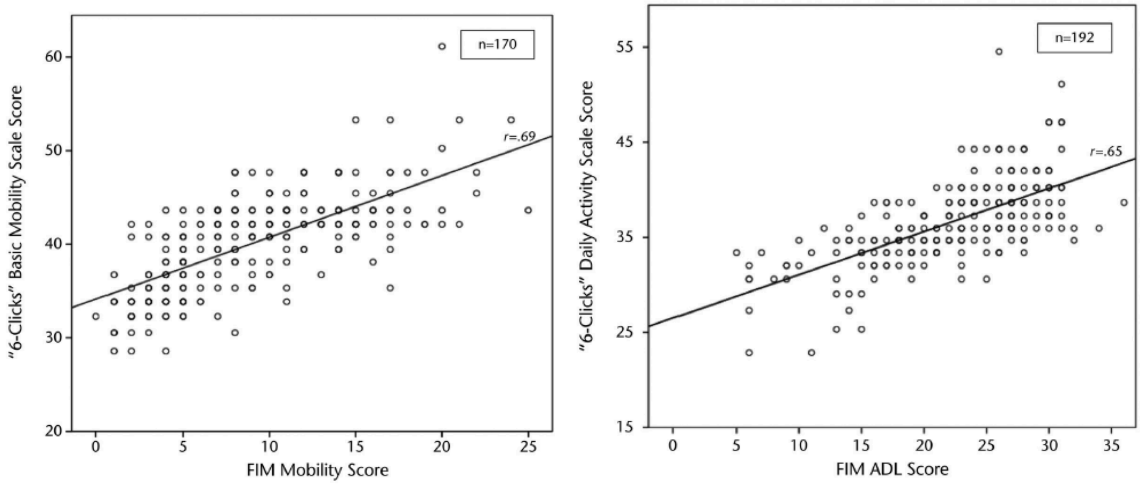
Perhaps the most important analysis was that which examined how initial AMPAC scores on the first visit predicted at least one follow-on visit. As expected, the data shows that patients with lower scores on their first visit are more likely to receive follow-on visits. Jette et al constructed ROC curves with sensitivity and specificity of patients needing a follow on at each AMPAC score cutpoint. Then, they calculated positive and negative predictive values assuming 50% receieved more than 1 visit. We can see how AUC for Daily Activity and Basic Mobility are 0.65 and 0.70 respectively.



In an efficient system, patients with a high AMPAC score should rarely receive more than one visit. In oder to see this, Jette et al look at the proportion of patients with 24 AMPAC (highest score) who received >1 visit.

In order to test for construct validity, Jette et al performed a number of analyses. It is important to understand how AMPAC distributions differ amongst these groups. One would expect that younger patients have higher scores on average than older patients, and that patients coming from home would have higher scores than those coming from extended care (nursing homes). Jette et al performed ANOVA and trend analysis across 4 age groups and 5 pre-admission settings to examine this. Indeed, older patients have lower scores, as do those in extended care. These trends were both significant with $P<0.001$.

One other critical analysis performed by Jette et al is the correlation between the longer-form FIM test and the 6-Click AMPAC. In both Basic Mobility and Daily Activity, the AMPAC was correleated with the 18-question FIM score with Pearson correlation coefficient of $r=0.29$ and $r=0.65$ respectively.



Assessment

Given the data available, the methods used by Jette et al to examine the data were fairly exhaustive. Furthermore, there is no question of sample size, except perhaps in FIM correlation. However, while Jette et al suggest that the 6-Click AMPAC score is an effective indicator of patient performance, it is important to note that the AMPAC system does not predict the likelihood of follow-up visits very strongly as indicated by relativey low areas under ROC curves.

Even if the area were higher, the ability of an AMPAC score to predict >1 visits is only moderately suggestive of an effective test. It is important to consider causality; namely, one cannot assume that AMPAC scores and the decision to perform a follow-up visit are independent. In fact, ReHAP uses AMPAC scores precisely for this purpose, and thus, the variables are very much dependent. Moreover, the correleation to a longer FIM test is only

moderate. Again, with the data available, Jette et al offered important insight into AMPAC validity. However, a future study could more successfully validate the scoring system by examining long-term followup and recovery over many years.

The study does offer important construct validation. It appears that the test is effective and free of any substantial flaws. However, a future study on inter-rater variability would be inportant to fully validate AMPAC.

Conclusion

Jette et al demonstrate some effectiveness of the AMPAC scoring system in quantifying a patient's performance in acute rehabilitation settings. While the results are weak on some fronts, the speed at which the test can be performed is sufficient to use for two main reasons:

1. **Speed**: 6-click AMPAC is very fast for OTs and PTs to perform

2. **Availability**: The system used by many therapy teams, and adoption is growing. Data is entered electronically in EMR systems, including those used at Hopkins and the test sites.

It is important to note from this study the tendancy to score patients at a 24. Based on interviews of the therapy teams at Johns Hopkins Bayview and some data available to us at ReHAP, this is common, and the software should recognize high AMPAC scores with low lag times, as these are indicative of a lapse in efficiency that could be improved. I plan on implementing a flagging system for this purpose.