Boston University
Activity Measure for Post Acute Care™ (AM-PAC)

Instruction Manual

AM-PAC Computerized Adaptive Testing
AM-PAC CAT™
Personal Computer Version

Basic Mobility, Daily Activity and
Applied Cognitive Functional Domains

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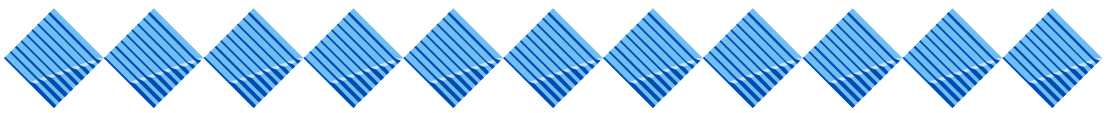

AM-PAC Computerized Adaptive Testing (AM-PAC CAT) Manual Personal Computer Version

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Acknowledgements

Work to develop the Boston University Activity Measure for Post Acute Care (AM-PAC) was undertaken at the Boston University Research and Training Center for Measuring Rehabilitation Outcomes and supported, in part, by the National Institute on Disability and Rehabilitation Research (grant no. H133B990005) and the National Institute of Child Health and Human Development (grant no. R01 HD43568). Development of the AM-PAC Outpatient Short Forms for use in outpatient settings was supported in part by an Independent Scientist Award (K01 HD45354-01) received by Stephen Haley, PhD.

Section 1: Introduction

1.1 Activity Measure for Post Acute Care (AM-PAC)™

The Boston University Activity Measure for Post Acute Care (AM-PAC)™ is an activity limitations instrument developed using the World Health Organization's ***International Classification of Functioning, Disability and Health*** **(ICF)**. According to the ICF, an activity limitation is defined as "difficulty in the execution of a task or action by an individual." [1] The AM-PAC™ was developed as a functional outcomes system that can be used across post acute care settings and consists of a comprehensive list of 240 functional activities (i.e., the item bank). It measures functional outcome by using contemporary measurement techniques, such as **Item Response Theory (IRT),** to overcome the limitations of traditional functional outcome measures (Jette and Haley, 2005). Unlike these traditional functional outcome measures which are disease, condition, or setting-specific, the AM-PAC was designed to be used across patient diagnoses, conditions and settings where post acute care is being provided; therefore, the AM-PAC is the ideal measure for developing benchmarks and for examining functional outcomes over an episode of post acute care, as patients move across care settings.

The AM-PAC instrument examines a set of functional activities that are likely to be encountered by most adults during daily routines within the context of either an inpatient episode of care or outpatient post acute services. We have defined *functional activity as the execution of discrete daily tasks*. Because functional activity is multidimensional, AM-PAC item banks are organized into three functional areas: **Basic Mobility** (101 items), **Daily Activity** (70 items), and **Applied Cognitive** (69 items**)**. Items for the AM-PAC have been drawn from two sources: (1) a set of *new items* that examine the functional content domains listed above; and (2) items from *existing outcome instruments* used in rehabilitation and post acute programs. The items in the AM-PAC assess multiple aspects (i.e., difficulty, assistance, limitations) of an individual's ability to perform specific daily activities. IRT analyses were used to scale individual items in different functional areas along a continuum of item difficulty.

Initially, AM-PAC test items were administered to a large sample of patients from different care settings with different diagnoses. Factor analytic work identified three distinct, interpretable factors that accounted for 72% of the variance: *Applied Cognition* (44%), *Daily Activities* (19%) and *Basic Mobility* (9%). These

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1. *International Classification of Functioning, Disability and Health (ICF).* Geneva, Switzerland: World Health Organization; 2001.

factors were verified by a confirmatory factor analysis (Haley et al. 2004) and defined as the three AM-PAC domains. Using Item Response Theory (IRT), items in each domain were scaled along a continuum of item difficulty. Items that were redundant or did not fit the model were eliminated. The remaining items formed the AM-PAC item banks, which included a wide range of items calibrated along a continuum of difficulty.

The instrument can be administered using responses coming directly from a patient, by professional judgment, or proxy report. Three AM-PAC versions are currently available:

1) Outpatient short forms
2) A free-standing computer version
3) A Web-based computer version

1.2 AM-PAC Computerized Adaptive Testing

Computer Adaptive Testing (CAT) uses a computer algorithm to pre-select the items that will be administered to a specific patient based on responses to previous items. **CAT**-based instruments have the following advantages:

- They reduce test burden while increasing test precision because test items are selected to match the patient's functional ability level.
- Patients are not required to respond to irrelevant test items.
- It is easy to integrate assessment into clinical work flow.
- They promote efficient and reliable data entry, analysis and management. AM-PAC data, along with patient data (age, gender, diagnosis, time since onset, surgical status, severity and insurance), are entered and stored in a database on the local computer or on a server.
- It only takes two minutes to complete each domain.
- They can include patient satisfaction questions.

CAT is an outcome measurement approach designed for comprehensive and precise point-of-care assessment of patient-related outcomes. It is being used with increasing frequency in the health field. This method of patient assessment uses a computer to administer test items to patients and is adaptive in the sense that each 'test' is tailored to the unique level of each patient. Each person who takes an adaptive test is taking a different version of the test because the items are administered on the basis of the patient's previous responses. By avoiding the administration of large number of questionnaire items and by selecting only those questions from a large 'item-bank' that provide the maximum amount of information based upon a person's responses to previous questions, **CAT** approaches allow for efficient point-of-care collection of accurate outcome information that can feasibly be implemented in busy clinical and research settings.

The computer-based versions of the AM-PAC assess the three domains in all post acute settings (inpatient, outpatient and home care).

1.3 AM-PAC CAT Functional Domains

The AM-PAC Basic Mobility domain includes 101 items that address basic movement and physical functioning activities, such as bending, walking, carrying, and climbing stairs. The AM-PAC Daily Activity domain includes 70 items that address basic self care and instrumental activities of daily life. The AM-PAC Applied Cognitive domain includes 69 items that access higher level cognitive functions that are necessary to live independently.

Listed below are examples of items from each of the AM-PAC domains.

Basic Mobility Domain:

How much DIFFICULTY do you (or the patient) currently have…

- moving from lying on your back to sitting on side of the bed
- getting up from the floor
- reaching overhead while standing, as if to pull a light cord
- using an escalator
- going up and down a flight of stairs inside, using a handrail
- walking around inside a building (50 ft, or 16 meters) on the same level
- going up and down three flights of stairs inside, using a handrail
- carrying something in both arms while climbing a flight of stairs (e.g., laundry basket
- climbing stairs step-over-step without a handrail (alternating feet)
- walking quickly indoors to answer the telephone

How much HELP from another person do you currently need …

- climbing a full flight of stairs without a railing
- moving from a bed to a chair

Daily Activity Domain:

How much DIFFICULTY do you (or the patient) currently have…

- reaching behind your back to put a belt through the loop
- inserting a key in a lock and turning it to unlock the door
- unscrewing the lid off a previously unopened jar without using devices
- tying shoes

How much HELP from another person do you currently need…

- putting on and taking off regular upper body clothing
- taking care of personal grooming

Applied Cognitive Domain:

How much DIFFICULTY do you (does the patient) currently have…

- explaining how to do something involving several steps to another person
- following/understanding a 10 to 15 minute speech or presentation (e.g. a lesson at a place of worship, a guest lecture at a senior center)
- describing something that has happened to you so that others can understand you
- carrying on a conversation with a small group (e.g., family or a few friends)
- telling someone that what they are doing is bothering you (e.g., interrupting or making noise that is distracting)
- getting to know new people
- reading a long book (over 100 pages) over a number of days
- reading and following complex instructions (e.g., directions to operate a new appliance or for a new medication)
- looking up a phone number or address in the phone book or in your own address book
- filling out a long form (e.g., insurance forms or an application for services)
- writing down a short message or note
- planning for and keeping appointments that are not part of your weekly routine, (e.g., therapy, doctor appointment, or a social gathering with friends and family
- remembering to take medications at the appropriate time
- using a calendar, or weekly activity planner to keep track of appointments and events
- putting together a shopping list of 10 to15 items

Section 2: AM-PAC CAT Software

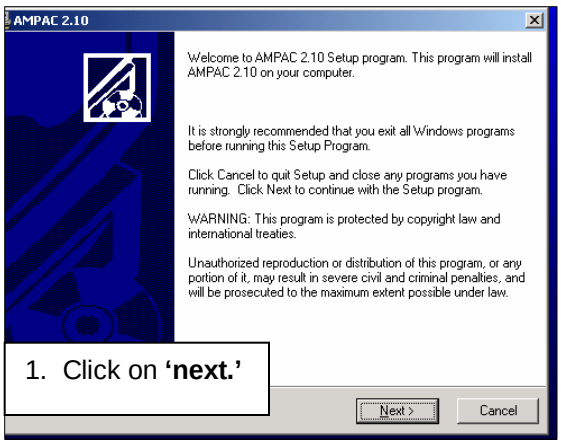
2.1 Hardware and Software Requirements

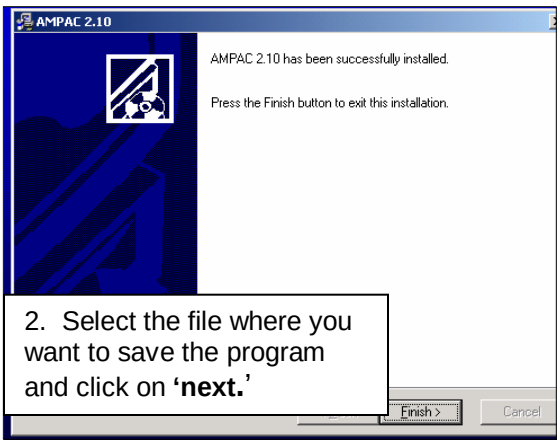
PC software and hardware requirements: Microsoft Windows XP, 512 MB of RAM and 10 GB of available hard drive space, Microsoft Office 2003. Microsoft Access is not needed to run the AM-PAC CAT program, but is needed to see data elements.

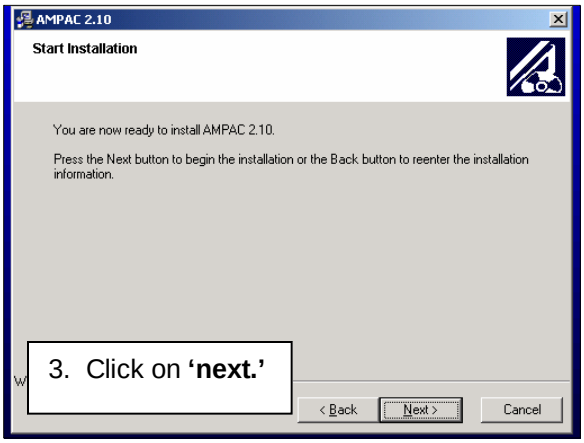
2.2 Downloading and Installing AM-PAC CAT Software

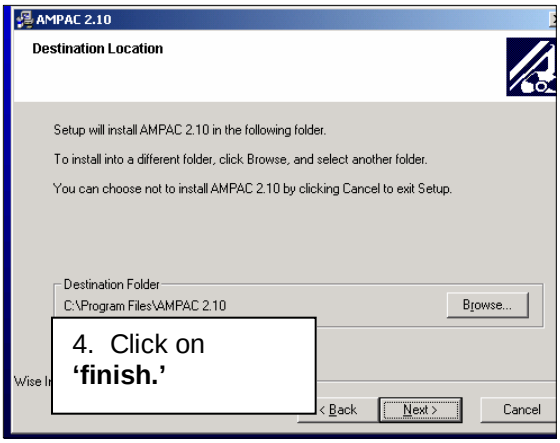
A trial version of the AM-PAC CAT is available, free of charge, for 7 days. When you purchase the AM-PAC CAT, you will receive an activation code that allows access for 365 days. AM-PAC CAT software is available for download at: **www.crecare.com**

First, you need to install the AM-PAC CAT software on your computer by using the set up program. Just follow steps 1-4, outlined below.



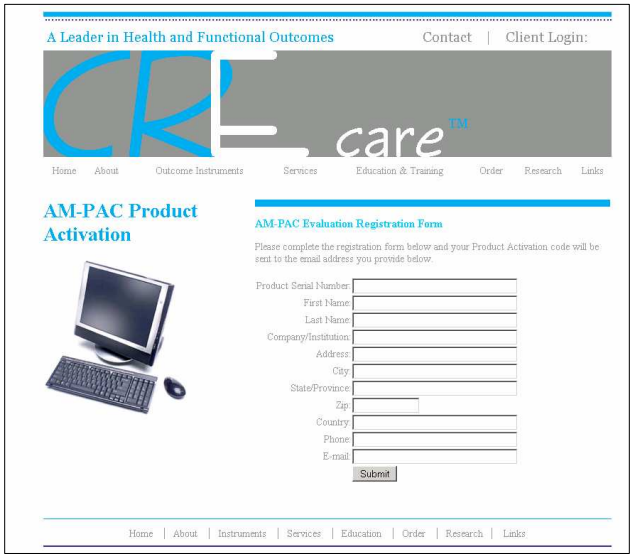






Now you need to activate the product and you need a product activation code. Click on the activation site (www.crecare.com/activate) or copy it into your browser.

You will see a registration screen. Complete the fields and click on **'submit.'**



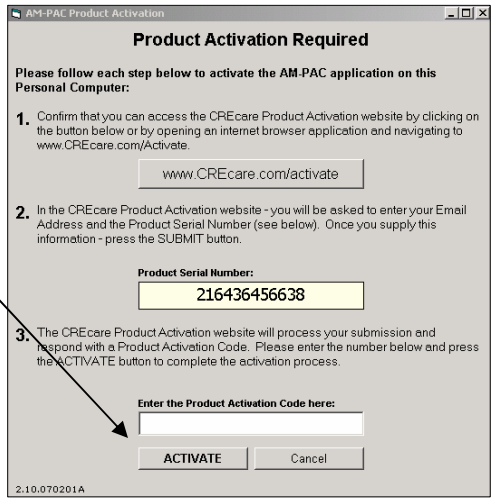
You will see a **'thank you'** screen notifying you that an email has been sent with your activation code.

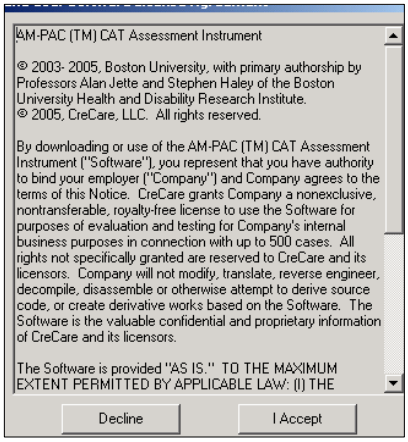
To the right, you can see an example of the email that you will receive with your activation code.

> Thank you for completing the AM-PAC™ Product Activation process. Please use the code below to activate the AM-PAC. This code will activate the AM-PAC application for the next 7 days. If you have purchased the AM-PAC 1 year subscription, a new Activation Code will be sent to this same email address within the next 24 hours.
>
> Product Serial Number: XXXXXXXX
> Activation Code: XXXXXXX

Copy the activation code into the blank field and click on '**activate.'**

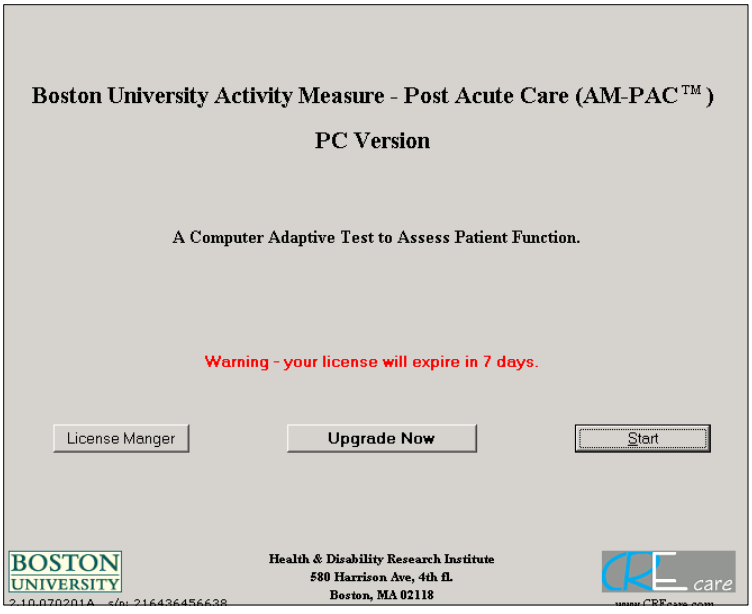
Review the term of agreement and click on **'I accept'**.





By clicking the '**Upgrade Now'** button, you will be brought to a web page where you can purchase a license for one year's use of the AM-PAC PC software.

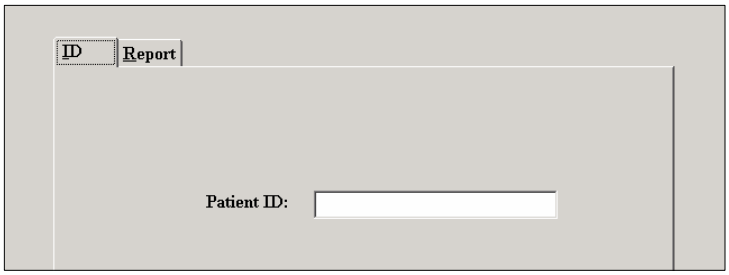
The '**License Manager'** button will expose the product number you will use to upgrade.



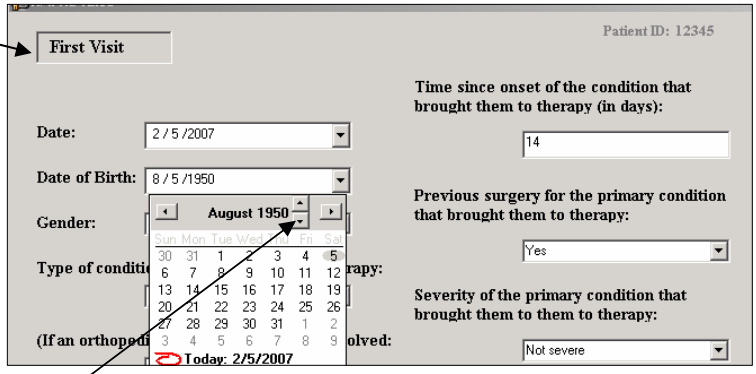
Section 3: Administering the AM-PAC CAT

3.1 Patient Demographic Information

Enter the **'patient ID'** number.



If the **'Patient ID'** number has not been used, the program will recognize that this is the patient's first visit and you will enter the patient's demographic and background information.



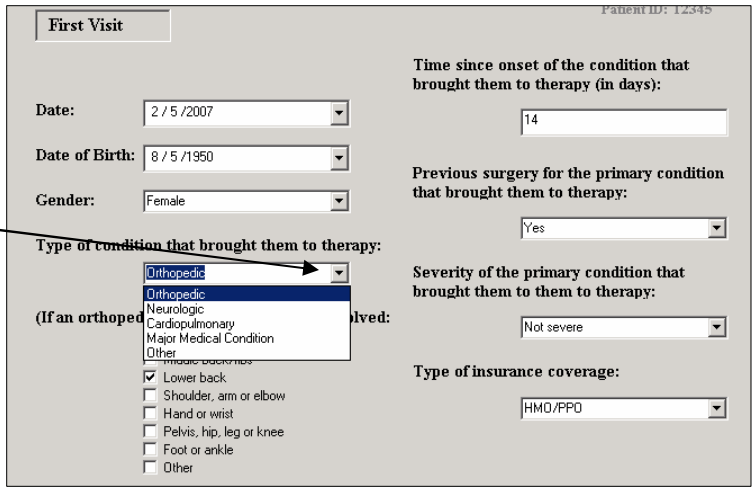
The **'Date'** field will be automatically entered.

To enter the **'Date of Birth'**, use the calendar that is available when you click on the drop down menu.

Change the year by clicking the up or down arrows. Change the month by clicking the side arrows. Finally, click on the correct day.

Use the drop down menu to select the **'Gender'**.

For **'type of condition'**, click on the drop down menu to view options and select the *primary condition* that brought the patient to therapy. If you select 'Orthopedic', click on the box next to the body part involved.

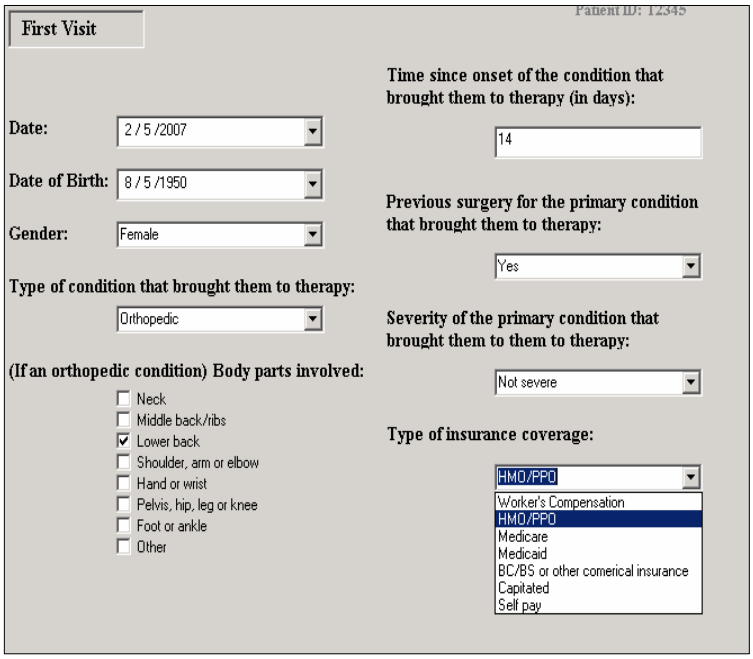


Enter **'time since onset'** in number of days.

Use the drop down menu to identify if there was a **'previous surgery'** for the primary condition that brought the patient to therapy.

Use the drop down menu to select from the following descriptions of **'severity'** of the primary condition:
Not severe
Mildly severe
Moderately severe
Extremely severe

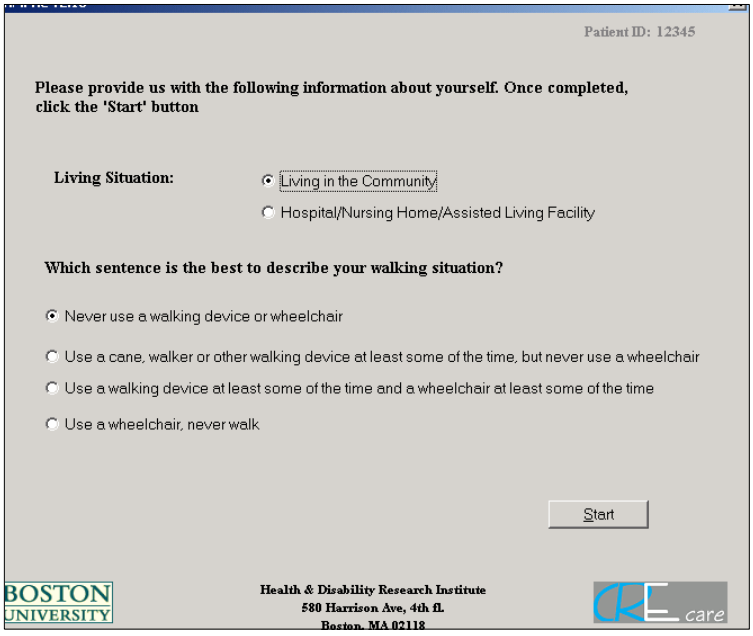
Finally, use the drop down menu to select **'type of insurance coverage'** from the list.



Click on **'next'**.

Click on the circle next to the best description of **'living situation'** and **'walking situation'**.

Click on **'start'** and begin answering functional questions.

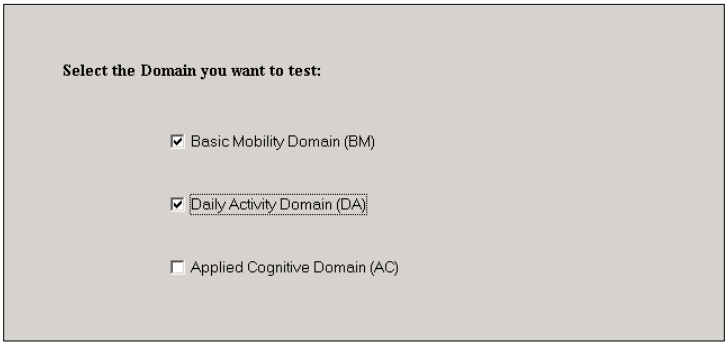


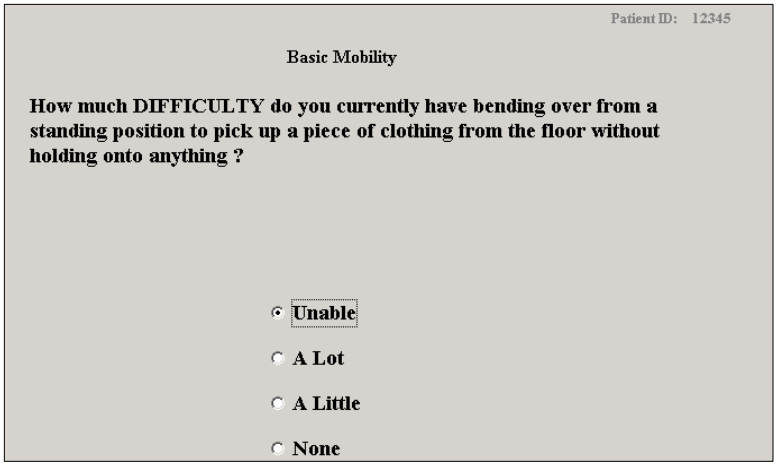
3.2 AM-PAC CAT Questions-Respondent Instructions

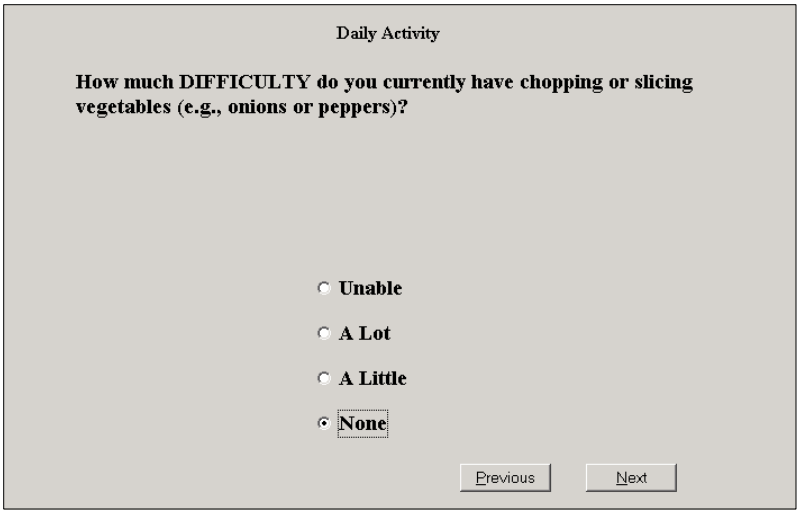
The following introductory statement can be used to instruct patients or clinicians on how to complete the AM-PAC Outpatient Short Form:

> "Please read each question and use the mouse, keyboard or stylus to click on the box under the statement that best describes your (or the patient's) current level of difficulty in doing each activity.
>
> Some questions ask how much difficulty you have doing activities.
>
> For example, for the question:
> *How much difficulty do you have doing light housework*:
>
> 1. Select 'unable' if you are not able to do this activity.
> 2. Select 'a lot' if it is a struggle to do this activity and you require a great effort and/or time.
> 3. Select 'a little' if you manage to do the activity, but notice that it takes more effort and/or time than you think it should.
> 4. Select 'none' if you do not experience any problems completing this activity.
>
> Other questions ask how much help or assistance you need to do activities.
>
> For example, for the question:
> *How much help from another person do you need to climb one flight of stairs without a railing:*
>
> 1. Select 'total' if you are unable to do this activity.
> 2. Select 'a lot' if you are only able to do the activity with considerable help from another person.
> 3. Select 'a little' if you do the activity almost by yourself.
> 4. Select 'none' if you do the activity completely by yourself.

3.3 Initial Evaluation

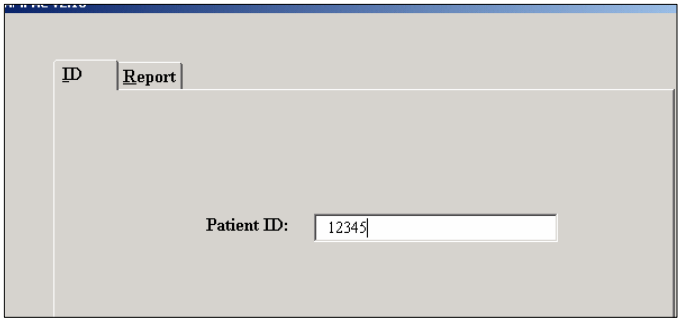


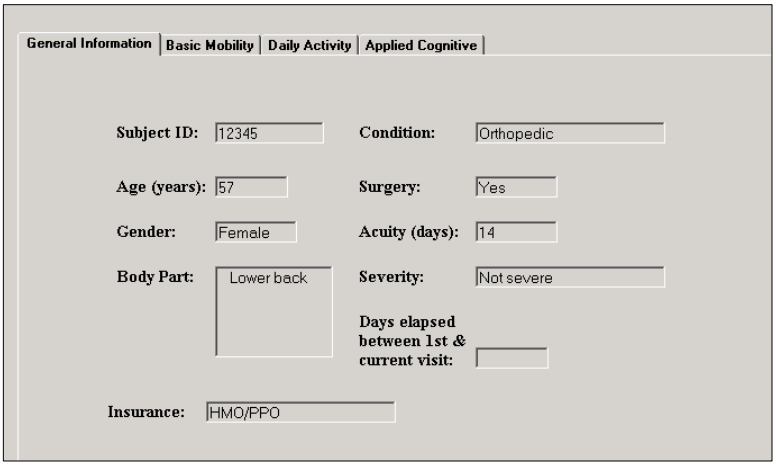




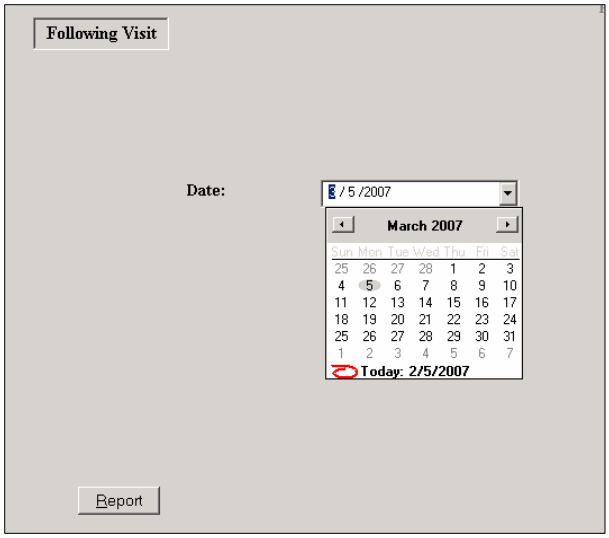
3.4 Follow Up Evaluation

If a patient has a completed AM-PAC CAT assessment in the system, the computer will recognize the '**Patient ID**.' You can view the patient report to ensure that the general information is accurate.

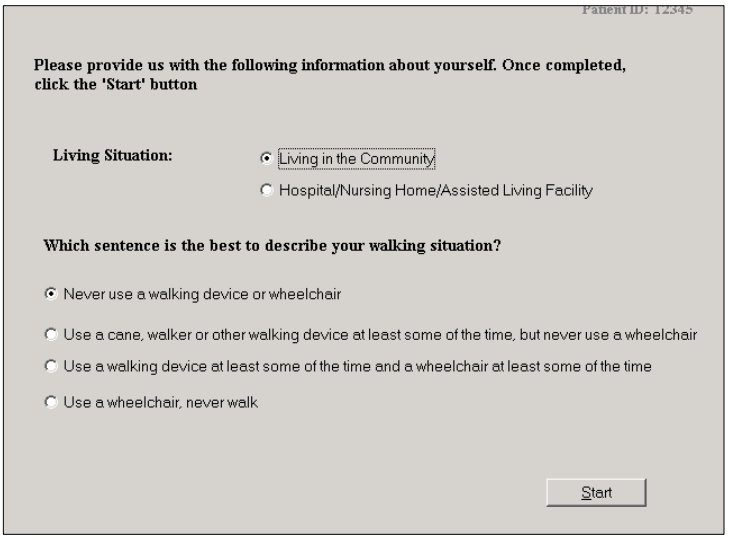




You will be asked to enter the '**following visit'** date. Enter the correct year, month and date by using the drop down calendar (similar to entering date of birth).

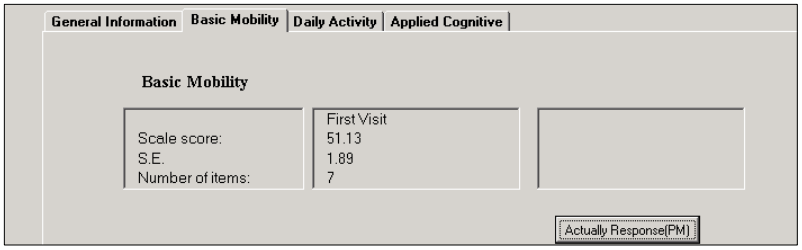


You will complete the **'living situation'** and **'walking situation'** questions again, as they may have changed from the initial visit.



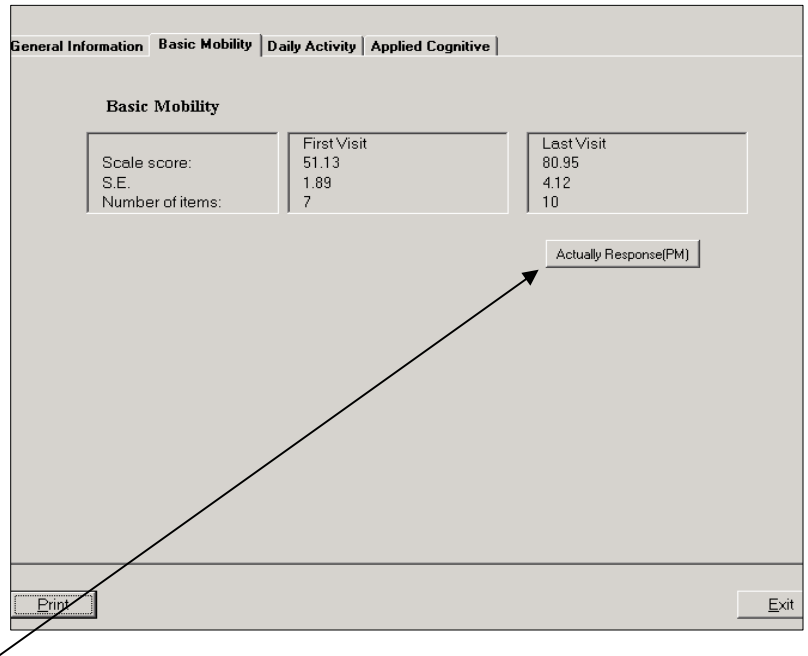
Section 4: AM-PAC CAT: Reports and Interpreting Scores

4.1 View and Print Reports



AM-PAC CAT formats provide individual patient reports. These reports summarize patients' general information and provide scale scores and standard error (S.E.) for each domain assessed.

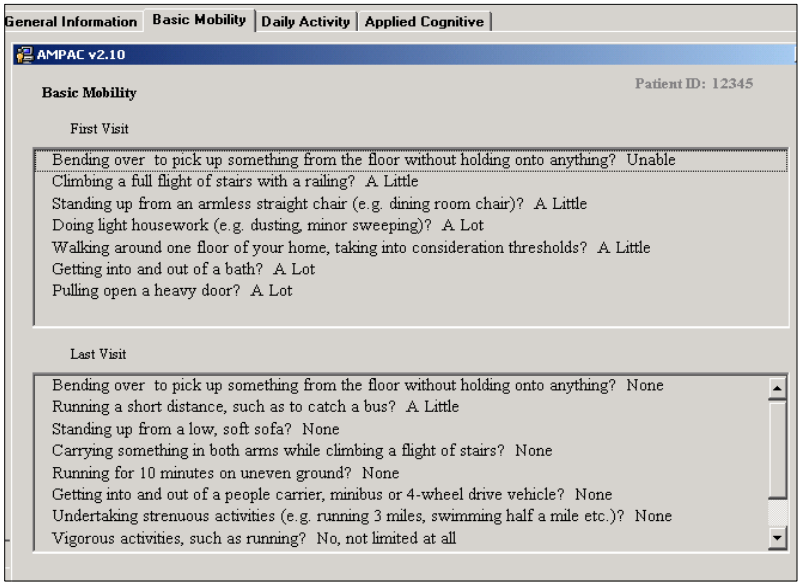
Click on one of the upper tabs--**General Information, Basic Mobility, Daily Activity** or **Applied Cognitive--**to view results.



Reports can be viewed and printed after initial and follow up visits. Follow up visit reports display the results of the first and last visits side-by-side for comparison.

You can print patient reports.

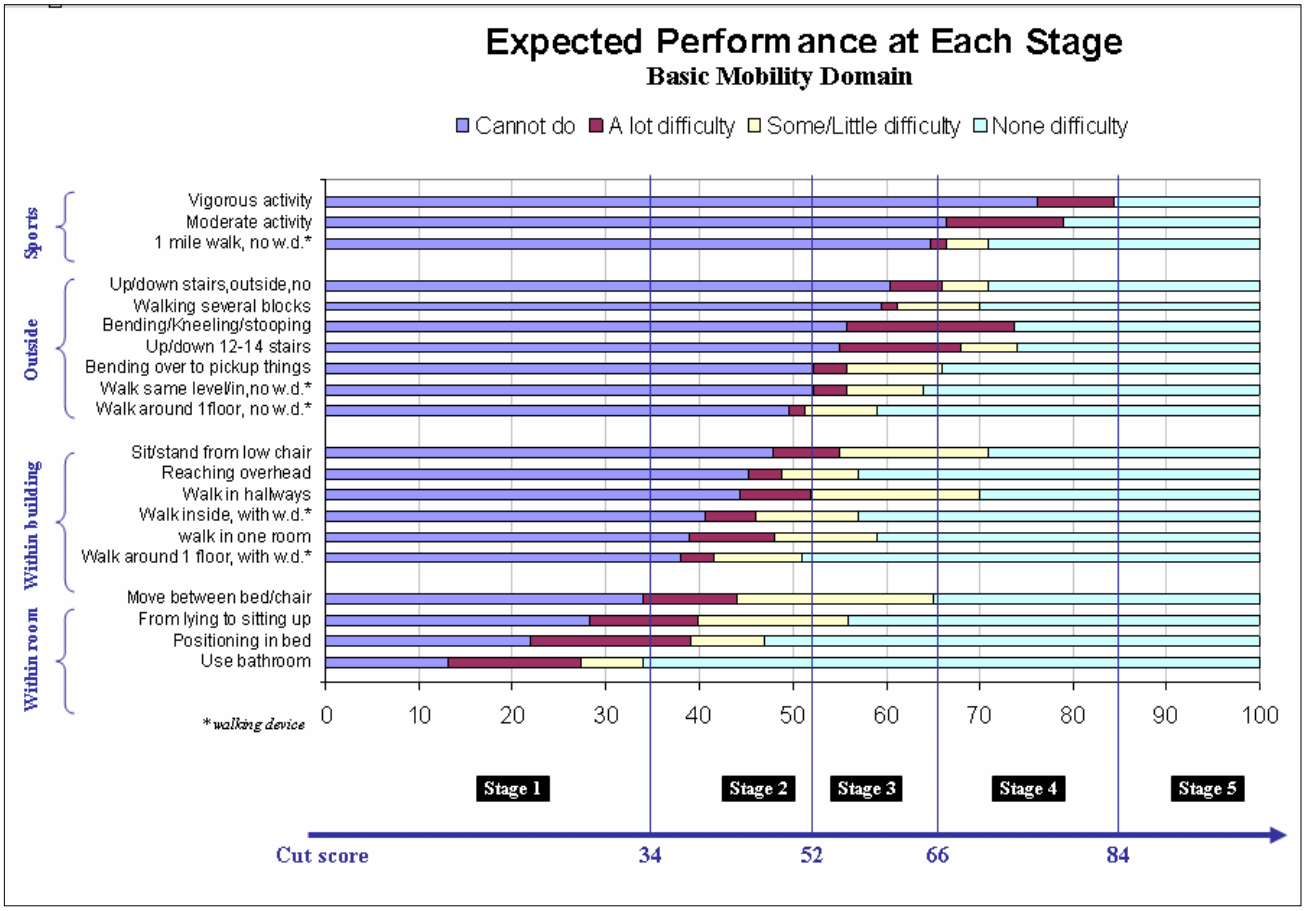
Patient responses to individual items can be viewed by clicking on '**Actually Response**.'



AM-PAC CAT items and patient responses for first and last visits.

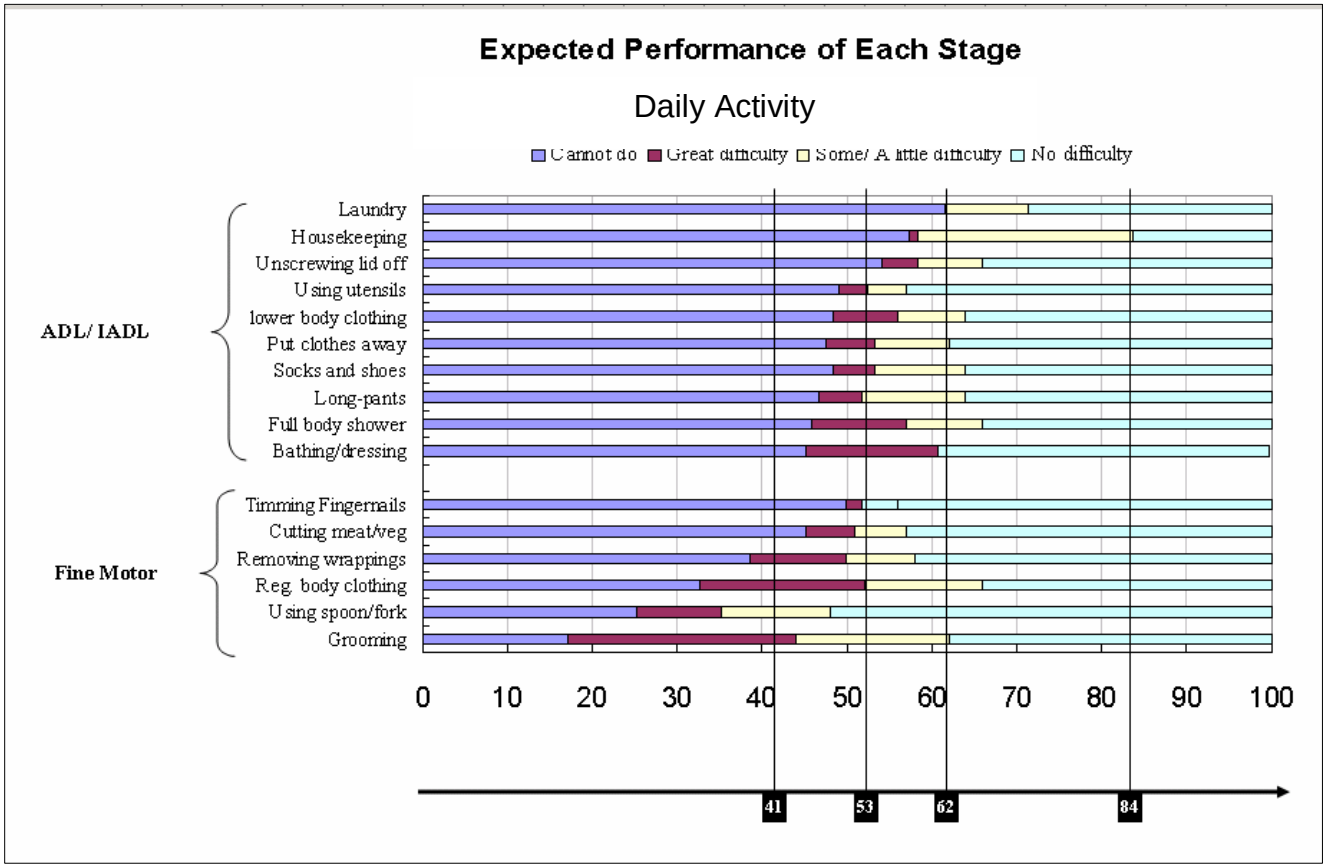
4.2 Interpreting Basic Mobility Scores

It may be helpful to have a context for interpreting AM-PAC scores. The table below relates AM-PAC Basic Mobility scores to clinically-significant functional stages. These stages were identified using data from over 1,000 cases across post acute care settings. The stages represent activities that are increasingly more difficult—from activities within a room or building, to activities outside, to recreation or sports. The level of difficulty exhibited by **most** patients with Standardized Scores in the specified ranges is described for each functional stage.



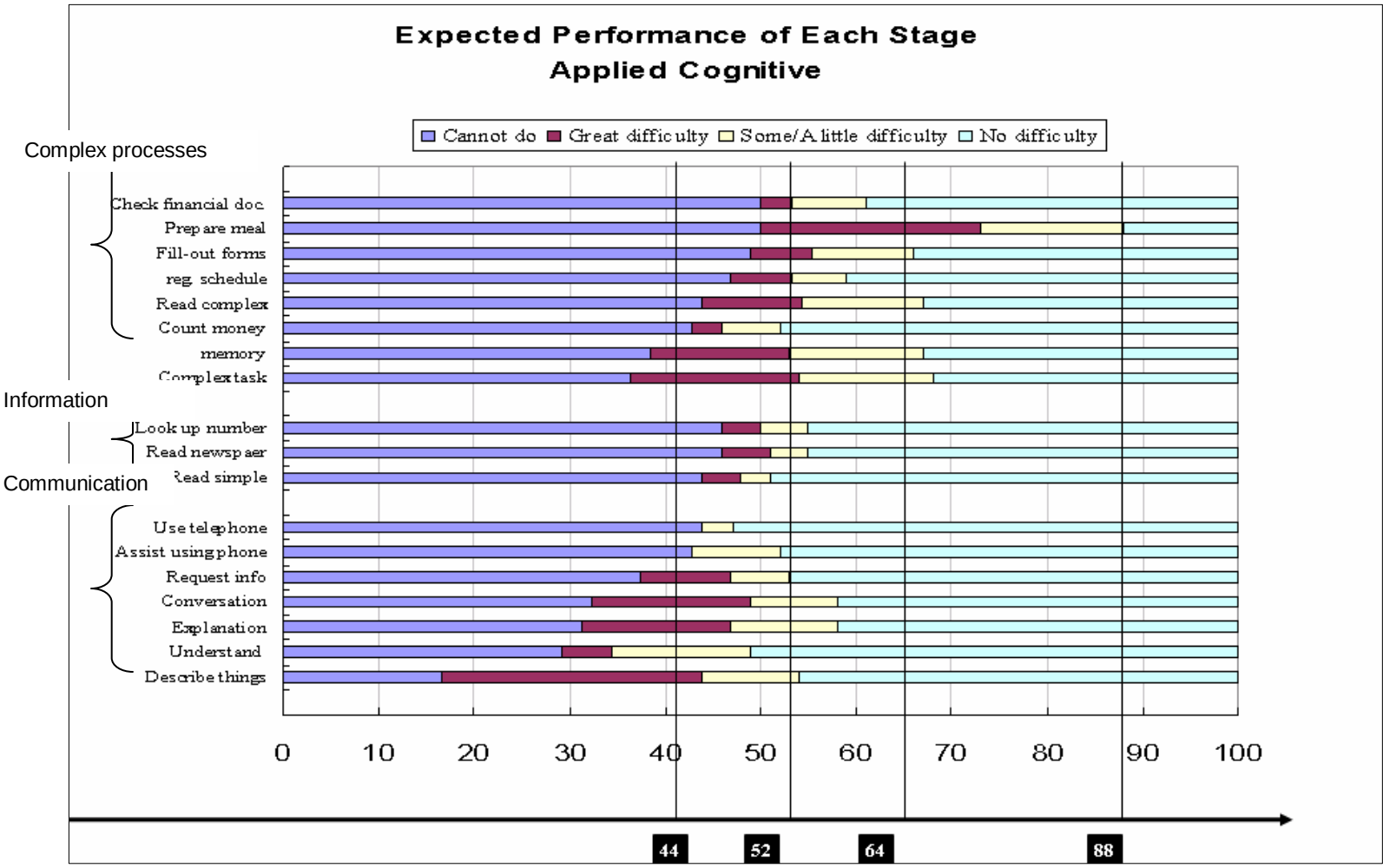
4.3 Interpreting Daily Activity Scores

It may be helpful to have a context for interpreting AM-PAC scores. The table below provides AM-PAC Daily Activity scores to clinically-significant functional categories of basic and instrumental activities of daily living and fine motor activities. These categories were identified using data from over 1,000 cases across post acute care settings. The level of difficulty experienced by **most** patients with standardized scores within the specified ranges is described for each functional stage.



4.4 Interpreting Applied Cognitive Scores

It may be helpful to have a context for interpreting AM-PAC scores. The table below provides AM-PAC Cognitive scores to clinically-significant functional categories of communication, information retrieval and complex processes. These categories were identified using data from over 1,000 cases across post acute care settings. The level of difficulty experienced by **most** patients with standardized scores within the specified ranges is described for each functional stage.



4.5 Facility Reports: Aggregate Data

The PC version of the AM-PAC CAT provides an aggregate report of all the AM-PAC assessment completed on the PC. The report provides a summary of the following areas: general information, severity, body part/impairment group, payment sources, condition, and AM-PAC average score for each of the three domains. The user chooses a time period for generating the aggregate report. The PC aggregate report contains only data entered into the personal computer. No additional data are included in the analysis.

Clients using the computer-based format server option can take advantage of CREcare reporting services that provide detailed reporting of aggregate data.

Section 5: AM-PAC CAT Computer Versions

5.1 Freestanding PC and Web/Server Versions

AM-PAC CAT Format Options

There are two options available to AM-PAC CAT users: a version that runs on a freestanding personal computer and a web-based or server version. The tables below summarize the benefits of each.

Stand-alone personal computer version

- » Users download the AM-PAC computer program onto a personal computer.
- » AM-PAC individual patient reports are available and can be printed.
- » AM-PAC data are stored locally on the hard drive.
- » AM-PAC data stored on computer can be viewed as an aggregate report.
- » AM-PAC data is stored in an Access database.

NOTE: this option is best suited for individual clinical sites where data are entered on a single computer.

Server-based version

- » CREcare helps install the AM-PAC on your server or provides remote access.
- » AM-PAC individual patient reports are available and can be printed.
- » AM-PAC data are stored on a server that can handle multiple clinical sites.
- » AM-PAC data can be merged across sites to produce an aggregate report.
- » AM-PAC data can be integrated with facility clinical and/or financial data.
- » CREcare data management and analysis services are available with this option.

NOTE: this option is best suited for organizations with multiple clinical sites where data are merged across an organization.

Section 6: References

6.1 AM-PAC and AM-PAC CAT Annotated Bibliography

Published work on the AM-PAC is included in the following citations. Work is ongoing.

Jette A, Haley S, Tao W, Ni P, Meyers D, Zurek M. Prospective evaluation of the AM-PAC-CAT in outpatient rehabilitation settings *Physical Therapy* (in press).

This prospective study evaluated the Activity Measure for Post Acute Care (AM-PAC) "item bank" and computerized adaptive testing (CAT) assessment platform (AM-PAC-CAT) in orthopedic outpatient physical therapy settings.

Andres P, Haley SM, Ni PS. Are patient-reported functional measures reliable in monitoring post acute outcomes? *American Journal of Physical Medicine and Rehabilitation* 2003;82(8):614-21.

This study examined test-retest and subject-proxy reliability of the AM-PAC. Results demonstrate acceptable reliability with the following intraclass correlation coefficients: 1.) test-retest summary scores for each of the three domains ranged between 0.91 and 0.97; 2.) subject proxy summary scores for each of the three domains ranged between 0.68 and 0.90.

Jette AM, Haley SM, Ni P. A comparison of functional outcome instruments used in post acute care. *Health Care Services Review* 2003;24 (3):45-60.

This article presents an empirical comparison of four functional outcome instruments used in PAC with respect to their content, breadth of coverage, and measurement precision. Results illustrate limitations in the range of content, breadth of coverage, and measurement precision in each outcome instrument. None appears well-equipped to meet the challenge of monitoring quality and functional outcomes across settings where PAC is provided. Limitations in existing assessment methodology have stimulated the development of more comprehensive outcome assessment systems specifically for monitoring the quality of services provided to PAC patients.

Haley SM, Coster WJ, Andres PL, Ludlow LH, Ni P, Bond TLY, Sinclair SJ, Jette AM. Activity outcome measurement for post acute care. Medical Care 2004;42 (suppl. 1):I-49-I61.

This study presents results from an initial exploratory factor analysis of AM-PAC items. Three distinct, interpretable factors were identified and accounted for 72% of the variance: Applied Cognition (44%), Personal Care & Instrumental Activities

(19%), and Physical & Movement Activities (9%); these 3 activity factors were verified by a confirmatory factor analysis. Scaling assumptions were met for each factor in the total sample and across diagnostic groups. Internal consistency reliability was high for the total sample (Cronbach alpha = 0.92 to 0.94), and for specific diagnostic groups (Cronbach alpha = 0.90 to 0.95). Rasch scaling, residual factor, differential item functioning, and modified parallel analyses supported the unidimensionality and goodness of fit of each unique activity domain.

Coster WJ, Haley, SM Andres PL, Ludlow LH, Bond T. Refining the conceptual basis for rehabilitation outcome measurement: personal care and instrumental activities domain. *Medical Care* 2004;42 (suppl. 1):I-62 - I-72.

This study examined the dimensional structure and content coverage of a Personal Care and Instrumental Activities item set and compared ADL and IADL items items from existing instruments (FIM, MDS, MDS-PAC, OASIS, PF-10) to a set of new items (AM-PAC) as measures of this domain. ADL and IADL items from existing rehabilitation outcomes instruments that depend on skilled upper limb and hand were located along a single continuum, along with the new items from the AM-PAC that addressed gaps in content. Results support the validity of the proposed definition of the Personal Care and Instrumental Activities dimension of function as a guide for future development of rehabilitation outcome instruments, such as linked, setting-specific short forms and computerized adaptive testing approaches.

Haley SM, Coster WJ, Andres PL, Kosinski M, Ni P. Score comparability of short-forms and computerized adaptive testing: an illustration with the Activity Measure for Post Acute Care (AM-PAC) *Archives of Physical Medicine & Rehabilitation* 2004;85:661-666,.

This study compared simulated short-form and computerized adaptive testing (CAT) scores to scores obtained from complete item sets for each of the 3 domains of the Activity Measure for Post Acute Care (AM-PAC). Inpatient and community-based short forms and CAT applications were developed for each of 3 activity domains (physical & mobility, personal care & instrumental, applied cognition) using item pools constructed from new items and items from existing post acute care instruments. Simulated CAT scores correlated highly with score estimates from the total item pool in each domain (4- and 6-item CAT r values ranged from .90-.95; 10-item CAT r values ranged from .96-.98). Scores on the 10-item short forms constructed for inpatient and community settings also provided good estimates of the AM-PAC item pool scores for the physical & movement and personal care & instrumental domains, but were less consistent in the applied cognition domain. Confidence intervals around individual scores were

greater in the short forms than for the CATs. The strong relationship between CAT and item pool scores demonstrate the CAT's ability to select specific items to match individual responses. The CAT may have additional advantages over short forms in practicality, efficiency, and the potential for providing more precise scoring estimates for individuals.

Haley SM, Andres PL, Coster WJ, Kosinski M, Ni P, Jette AM. Short-form activity measures for post acute care (AM-PAC). *Archives of Physical Medicine & Rehabilitation* 85;649-660, 2004.

This study used item response theory (IRT) and item pooling procedures to develop inpatient- and community-based short forms for each of 3 activity domains: physical & movement, applied cognition, and personal care & instrumental. Items consisted of new items and items from existing post acute care instruments. Items were selected for inclusion on the short forms to maximize content coverage and information value of items across the range of content and to minimize ceiling and floor effects. We were able to match the distribution of sample scores with very good item precision for 1 of the constructs (physical & movement); the other 2 domains (personal care & instrumental, applied cognition) were more challenging because of the variability in patient recovery and ceiling effects.

Jette AM, Haley SM. Contemporary measurement techniques for rehabilitation outcome assessment. *Journal of Rehabilitation Medicine* 2005; 37: 339-345.

This paper reviews the limitations of traditional rehabilitation functional outcome instruments currently in use within the rehabilitation field to assess Activity and Participation domains as defined by the International Classification of Function, Disability, and Health. There is an emphasis on how contemporary measurement techniques, such as item response theory methods combined with computer adaptive testing methodology, can be applied in rehabilitation to design functional outcome instruments that are comprehensive in scope, accurate, allow for compatibility across instruments, and are sensitive to clinically important change without sacrificing their feasibility.

Coster W, Haley S, Jette A: Measuring patient-reported outcomes after discharge from inpatient rehabilitation settings. *J of Rehabilitation Medicine* 2006;38:237-242.

This study examines the sensitivity of the Short Form Activity Measure for Post Acute Care (AM-PAC) compared to the Functional Independence Measure (FIM) across a 12-month period after discharge from rehabilitation hospital. All 3 AM-

PAC scales were sensitive to both positive and negative change across the follow-up period. Standardized response means for the AM-PAC were consistently larger than for the FIM across patient and severity groups. A greater percentage of patients showed positive change that exceeded the minimal detectable change on the AM-PAC than on the FIM both 6- and 12-month follow-ups.

Haley SM, Ni P, Coster WJ, Black-Schaffer R, Siebens H, Tao W. Agreement in functional assessment: graphical approaches to displaying respondent effects. *American Journal of Physical Medicine and Rehabilitation* 2006;85:747-755.

This prospective, cohort study compares proxy vs. patient report in hospital and community settings. Intraclass correlation coefficients on summary scores between patient and proxy report were as follows: physical and mobility ICC = 0.92; personal care and instrumental ICC = 0.93; and applied cognition ICC = 0.77. Graphic approaches helped interpret differences in separate analyses of clinician and family agreement are also presented as a useful method for interpreting agreement data that may be useful in determining the meaningfulness of the amount and direction of interrespondent variation.