PRAI Validation Analysis Plan March 7, 2013

Objective

Develop an analysis plan for validity/reliability study for the Patient- Reported Arthralgia Inventory (PRAI) based on the data available from the BCAT study. A second goal is to determine whether the sum/mean is a better summary score than the maximum.

Introduction

Liana Castel developed the Patient-Reported Arthralgia Inventory (PRAI) to assess joint pain and stiffness among two groups: postmenopausal women taking aromatase inhibitors for the treatment of early stage breast cancer, and postmenopausal women without breast cancer. Currently there is no validated instrument to measure arthralgia that results from aromatase inhibitor therapy. The instrument asks about pain (16 items that comprise left and right fingers, wrists, elbows, shoulders, hips, knees, ankles, and toes) and stiffness (16 items, same body areas) over the past 7 days on a numeric rating scale 0-10. Dr. Castel based the PRAI on the Regional Pain Scale. The goal is for the PRAI to be adopted for use in measuring arthralgia in this patient population.

Data available

From the BCAT study, we have PRAI data on 300 people, 8 longitudinal surveys over one year. For these patients, we also have medical record data for 98 in the AI group. At the time of each PRAI observation, we also have the patient’s response to this item from the FACT-ES “I have pain in my joints,” referring to the past 7 days, and rated from 1 to 5. We have concurrently collected PROMIS pain interference, ECOG performance status, and PROMIS physical function. We have self-reported joint comorbidity (Y/N, Yes if any of the following checked: osteoarthritis, rheumatoid arthritis, psoriatic arthritis, lupus, gout, ankylosing spondylitis, fibromyalgia, osteoporosis, osteopenia, or Sjogren's syndrome.). Also, the single item last 7 days “Have you had overall morning stiffness in your muscles or joints” (Y/N)

Types of validity/reliability and possible analysis to demonstrate/assess

· **Known groups validity**-*instrument’s ability to differentiate between different groups known to vary on the construct(s) being measured.* We can assess associations between the PRAI scores and self-reported joint comorbidity.

· **Longitudinal validity**-*extent to which changes in one measure will correlate with changes in another measure*. We can assess this using the longitudinally-collected PRAI data and longitudinally-collected FACT-ES question, and/or PROMIS pain interference and/or ECOG performance status.We could use longitudinal models with time-varying covariates.

· **Test-retest reliability-***ability to yield the same result for a single individual at different assessments which are closely spaced so that any variation detected reflects the reliability of the instrument rather than changes in the patient’s status.* In the control group, we do not expect change in arthralgia over time, so we could establish test-retest reliability in this group using some of the multiple assessments.

· **Concurrent validity**- *concordance with results of a gold standard measured concurrently*. This may be possible to assess by comparing with the PROMIS pain interference scale.

· **Construct validity**- *instrument’s ability to measure a particular construct. Can be assessed by the extent to which the measure’s results are consistent with experts’ theories about the construct of interest.* In this case the construct is arthralgia. One theory could be that patients taking aromatase inhibitors would exhibit greater arthralgia than controls. We can refer to the first paper about this theory, which demonstrates a difference between the groups. Another theory is that arthralgia related to aromatase inhibitor therapy may be most likely to occur in the hands. This can be assessed in our data, but we are planning a separate pain locations analysis/paper.

· **Criterion validity***-extent to which a measure provides results that are consistent with a gold standard, including predictive validity.* We could see if the PRAI predicts outcomes on other scales. This seems similar to what we proposed to demonstrate known groups validity.

· **Sensitivity and specificity-** we could possibly look at the PRAI’s diagnostic value – e.g., how well having a statistically significant and/or clinically meaningful increase in arthralgia over time predicts a clinical outcome on follow up surveys.

. **Chronbach’s alpha-***measure of internal consistency, i.e. whether questions are "measuring the same thing".* We can look at Chronbach's alpha across all the questions to determine natural groupings based on high correlations, e.g. is pain associated with stiffness, or are they two separate constructs?

· **Discriminant validity**- *measures that should not be related are not.* *Need to see useful examples of this demonstrated.*

The validation can be conducted for the measure of sum pain, but can also be repeated for other alternative outcome measures, e.g. the maximum pain score, an average of the highest 4 pain scores, etc., with the goal of determining the "most valid" scoring method for the PRAI.

We will start with validation using the initial baseline data, but need to consider more carefully how to incorporate longitudinal data into the validation analyses. These could be done with multiple cross-sectional analyses (e.g. 0, 3, 6 months), or with more complicated longitudinal analysis methods.