STUDY OF OSTEOPOROTIC FRACTURES

PROTOCOL - NEUROMUSCULAR PERFORMANCE EXAMINATION

Footwear: These tests should be performed in tennis shoes or in shoes with very low or no heels. Some of the tests are much harder to perform with heels on. To eliminate the effect of footwear on test performance, we are asking all participants to come to the clinic equipped with low-heeled footwear. Admittedly, we may lose some information on fall risks by standardizing footwear, but most women will regularly wear several different types of footwear anyway. If a participant is wearing narrow heels 1 inch or higher, ask her to remove her shoes and wear a pair of disposable hospital slippers. The participant may perform the test in stocking feet if she prefers.

Dress: Some of the tests are easier to score if the participant wears slacks. All participants are asked to wear slacks.

Instructions to participants: To some participants, the detailed verbal instructions may seem pedantic or unnecessary. It may help to say that you are going to explain each test to the participant in detail since this is the best way to make sure that everyone does the test in a similar manner. In addition, the detailed protocols indicate which scripts are required and which are optional. It is up to the individual examiner to determine whether a participant understands what is required of her and to provide the appropriate level of instruction. **Note:** All scripts for the exams are underlined. Portions which are optional or which are only spoken in certain circumstances are enclosed in parentheses.

Screening: Ask each participant "Do you have any problems from recent surgery, injury, or other health conditions that might prevent you from standing up from a chair or walking up steps." If the answer is yes, record on the scoring form. Tell the respondent who says yes that after you describe each test to her, you will discuss whether she should attempt the test given her physical problem.

Refused/unable: If a test is not attempted because the participant refuses or prefers not to, for whatever reason, record "refused" on the scoring form. If a test is attempted but the examiner or the participant decide that the test cannot be completed, record "unable" on the scoring form (unless special instructions are given in the detailed protocol or on the scoring form).

Aids: Walking aids may be used on the Measured Walk test. The use of aids should be discouraged for the Turning Balance and Tandem Walk tests. (Use of aids should be recorded for the Turning and Tandem Walk tests.) Aids may not be used for the Chair-Stand, Step-up and Tandem Stand tests.

Demonstrations: Demonstrate each maneuver for the participant.

1) Chair-Stand

Equipment: A plastic molded, armless, straight backed chair approximately 45 centimeters high at the front edge and 38 centimeters deep. The seat should incline no more than a few degrees from front to back. A thin strip of masking tape placed across the seat of the chair half way between the front and back of the seat. Stopwatch. One examiner.

Description: ability to move forward while seated (trunk control), ability to stand up from a standard chair without using arms and the time required to stand up from a chair five times measured with a stopwatch.

Administration:

Place the back of the chair against a wall to steady it. Stand next to the participant to provide assistance if she loses her balance.

I. Scoot forward

Instruct the participant to sit as far back as possible in the test chair with the feet resting on the floor and the arms folded across the chest. Explain to the P, "First, would you please fold your arms across your chest and move forward in the chair without using your arms so that your sitting about half-way toward the front of the seat." NOTE : P should end up with her knees flexed to about 100 degrees and the back of her fanny at about the tape mark on the chair. If she cannot move, say "O.K., try to move forward using your arms."

II. Stand up once

"Very good. Now please try to stand up without using your arms." If she is unable to arise without using arms say "O.K., try to stand up using your arms to push off."

If she is unable to stand on her own, stand in front of her and offer both of your hands for her to hold. Then say "O.K. see if you can pull yourself up while holding on to my hands." Hold your arms steady but do not provide lift.

Record on the data form:

i) whether she is able to move or scoot forward without using her arms to push off. It doesn't matter how this is accomplished as long as the arms are not used for support.
ii) whether she arises without using her arms, using her arms, or with the help of the examiner, and
iii) whether she requires more than one attempt to arise (attempts include rocking and weight shifting).

III. Stand up 5 times

NOTE: If participant is unable to stand on her own using her arms to push off, then do not ask her to stand up 5 times.

a) Ask the participant to resume the sitting position she was in just before standing up, with the feet resting on the floor and the arms folded across the chest. Explain to the P, "The next test measures the strength in your legs. Keep your arms folded across your chest. When I say 'Ready? Stand.', please stand up straight as quickly as you can five times without stopping in between (and without using your arms to push off/using your arms to push off if you need to). After standing up each time, sit down and then stand again. I'll be timing you with the stopwatch."

[OPTIONAL]: Ask her to practice by standing up twice to make sure she knows what to do. If she must use her arms to stand, let her perform the test in that manner and record on the scoring form that she "used arms".

b) When the subject is properly seated after practicing say "Ready? Stand.". Count out loud as she arises each time, up to 5. Stop the stopwatch when she has straightened up completely the fifth time and all body movement has ceased. If she sits down after the fifth stand-up, stop timing as she begins to sit down.

c) Record the time to the nearest tenth of a second. If the subject is unable or refuses to perform the test, or uses her arms to arise, record this in the appropriate place on the scoring form.

d) In the event she fatigues before completing 5 stand-ups, confirm that she can't do any more by asking "Can you continue?". If she says yes, keep timing. If she says no, record that she could not complete five stands by entering 7 under "armuse" and 99.9 under "time" on the scoring form.

2) Foot Tapping

Equipment: Two three inch wide circular targets painted on a thin board (1" x 4" x 24"), with centers 12 inches apart. (Do not put the circles directly on the floor or carpet.) A rubber bath mat placed under the board to prevent it from sliding. Stop watch.

Description: Timed performance in repetitive, lateral foot movement task: 10 foot taps.

Administration:

a) With the participant seated (you may use the molded plastic chair), show her the circular floor targets. The leg to be tested should be centered between the two circles. The middle of the circles should be placed about 16-24 inches from the front edge of her chair, depending on leg length and what is comfortable. Ask her to touch both circles with the ball of her foot. If she cannot reach both easily, bring the board close enough to her chair so that she can reach both circles easily and still be able to see the circles over her knees.

b) Explain that "For this test, tap the ball of your foot on the circles as fast as you can. First tap one circle and then the other, as many times and as fast as you can. I'm going to keep time and count the taps. It doesn't count unless you hit the circle with your foot. First we'll do the right foot and then the left foot." As you explain, demonstrate the foot tapping for the participant.

c) Make sure that she can reach both circles with her foot. "Ready with the right foot? Begin." Start the stopwatch at the word "Begin" and stop timing after the tenth foot tap. Tell the participant to stop. **Note: Only count taps in which some part of the foot actually hits the target.** (It doesn't have to be the ball of the foot.) Thus some participants may take longer than others to complete ten taps due to inaccuracy.

d) Record the time taken to tap ten times for both feet to the nearest tenth of a second. If she cannot complete 10 taps after 2 attempts, record 99.9 in the space for time.

3) Turning Balance

Equipment: none.

Description: observation of balance and number of steps during 360° turn.

Administration:

a) Have the participant stand. "While you're standing here, I would like you to turn all the way around so that you end up facing me again. You can turn in either direction."

b) As the participant turns, count the number of steps taken, including the first and last foot movements. If she pivots on one foot, ask her to turn around again using both feet.

c) Record:

i) whether steps are continuous and smooth or discontinuous and "blocky" (en bloc)

ii) whether the P is steady on turning or unsteady (reaches, grabs, staggers)

iii) number of steps in turn.

4) Step-Ups

Equipment: Step stool. Stopwatch. One examiner.

Description: Ability to step up and down a single step without arm support and the number of steps up on a single step stool with arm support in 10 seconds.

Administration:

I. Stepping up and down without arm support.

Place the step stool about 3 feet from the wall, facing the wall.

a) Have the participant stand in front of the stool. Stand on the side of the step stool without the handrail and be ready to assist. Say, "I would like you to step up onto the stool with both feet without holding on to the handrail." If she cannot do it without holding on to the handrail, say "OK, try to step up using the handrail." If she cannot step up using the handrail, assist her onto the step.

b) "OK, good. Now I would like you step down BY STEPPING FORWARD, again without using the handrail." If she is unable to do it without using the handrail, say "OK, try to step down while holding onto the handrail". If she cannot step down using the handrail, assist her in stepping down.

c) Record:

i) whether P steps up without holding on, by holding on, or with the examiner's assistance,

ii) whether P steps down without holding on, by holding on, or with the examiner's assistance.

II. Rapid step-ups

NOTE: if the participant cannot step up without assistance from the examiner, do not attempt the rapid step-ups.

For greater safety, position the step stool facing a wall. The base should be about eight to twelve inches from the wall, depending on the the size of the participant.

a) Tell the P, "This is a test of the strength and coordination in your legs. I would like you to step up on this step as many times as you can in ten seconds." Demonstrate the step-up test for the P by stepping up and down rapidly (saying, "You must hold onto the rail but you can use either hand. Then step up on the stool with either foot and bring the other foot up so that both feet are on top of the stool. Then step back down from the stool with either foot and bring the other foot down so that both feet are on the ground. Then step up again and keep going.) Step up and down rapidly as many times as you can safely do it in the time I give you. I'll tell you when to stop."

b) The examiner should stand behind and to the side of the stepstool with the handrail. Steady the stool by holding on to the rail and pushing a foot against the base. (If she seems uncertain about what to do, ask her to take a couple of practice steps.) When the P is properly positioned, say "Ready? Begin".

The stopwatch should be started at "Begin.". Count "one" when both feet are on the stool, "two" when both feet are back on the floor, etc. It may help to count aloud. If the time expires when the subject has only one foot on the stool or the floor, a half step should be added to the score. After ten seconds have elapsed, make a mental note of the number of complete step-ups, and then say "Okay, stop".

c) Record the number of step-ups to the nearest one-half step. (Note: the half-steps are more important for the participants who are very slow on this test. In this case, the half steps are also easy to count.)

5) Measured Walk

Equipment: Gait course laid out as in Figure 1. Stopwatch. Two examiners.

Description: time required to walk a six meter course (seconds), average step length (centimeters), abnormal gait characteristics (present or absent), and arm swing (normal, reduced or absent).

Note: Occassionaly, a participant will be so unsteady on her feet that the examiners will be concerned for the participant's safety. In all instances there should be one examiner close to the P to support her if they should trip or lose her balance. Special precautions must be taken for the P who is visibly unstable. The examiner may decide not to perform the test if the P appears to be in imminent danger of falling e.g. someone who arrives in a wheelchair but wants to try every test. However, as a general rule each subject should be encouraged to attempt the test. If a P is too unsteady to perform the test, but tries, the score should be recorded as "unable". If the examiner decides that the test should not be attempted for safety reasons, this should be recorded as "unable". Walking aids may be used on this test.

Administration:

a) Tell the participant, "Now we are going to observe how you normally walk. If you use a cane or other walking aid and would feel more comfortable with it, then you may use it during the test". Record which type of aid is used, if any, on the scoring form.

Have the participant stand just behind and in the center of the starting line on the gait course. Explain that, "This is our walking course. I want you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the store. I want you to walk all the way past the line at the other end before you stop. I will walk with you and count your steps and time you. (OPTIONAL FOR PS WHO ARE VERY UNSTEADY: One of us will always be beside you to steady you if you begin to loose your balance.)"

b) When the P is properly positioned at the start line. Examiner One says, "Ready? Begin.". Examiner One starts the stopwatch at the word "Begin" and stops timing when one of the P's feet is all the way across the end line. Examiner One also walks beside the participant and counts the number of steps taken to cover the course. One step is counted when either foot is picked up and placed down on the floor, including the first step and the step which first takes a P's foot completely across the end line.

On the first trial, Examiner 2 walks in parallel a few feet away and rates the P on **continuity, limp and armswing.** If the P stops or hesitates markedly between two or more steps in midcourse, check "stops" on the score form, otherwise check "no stop". A marked limp, waddle or side to side headsway should be recorded. A "normal" armswing is scored if the entire hand generally moves past the outline of the body (hips and thighs) on the forward swing i.e "daylight" can be seen between the hand and the body. Score a "reduced" armswing if the movement of the arm fails to take the entire hand past the outline of the body on the forward swing, but the arm still moves. (If clothing obscures the outline of the body, then score "reduced" if the forward movement of the whole hand is less than about 3 inches from the axillary line of the body). Score "arm immobile" if the subject does not move the arm at all. Evaluate each arm independently. If either arm is held away

from the body and out to the side as if for balance, record in the appropriate box.

After Examiner Two has recorded continuity, limp and armswing, Examiner One should call out the time and steps to be recorded by Examiner Two.

c) When the participant reaches the end of the course, ask her to turn around and stand at the end line as before. Tell the P, "Now I would like you to do the same thing going back in the other direction. Walk at your usual pace, and go all the way past the line at the other end of the course. Ready? Begin." and simultaneously start the stopwatch. Time the second six meter walk and count the number of steps taken, as above.

On the second trial Examiner 2 rates the P on **foot swing, step symmetry and shuffle.** If the heel of the P's swing foot (stepping foot) fails to pass or clear the toes of the P's stance foot (stationary foot) on two or more steps, check "not pass" on the scoring form. Otherwise, check "passes". If foot swing is difficult to evaluate because the step length is about equal to the length of the foot, then check "step length equals foot length". If the right and left steps appear to be unequal in length, check "unequal" on the score form, otherwise check "equal". If either foot drags, shuffles or fails to clear the floor on two or more steps, record this in the space provided on the scoring form.

Note: If two examiners are not always available, the gait abnormilities may be rated by Examiner One on additional trials in which time and steps are not recorded.

c) Record:

i) the time required for the two trials of the six meter walk to the nearsest tenth of a second,

ii) the number of paces required to cover the course for the two six meter trials

iii) the presence of abnormalities of gait:
1) armswing ("normal", "reduced", "immobile") for both arms, arms out (normal, holds arms out for balance)
2) continuity of gait ("no stops" or "stops"),
3) limp (present, absent)
4) foot swing ("passes" "step length equals foot length" or "not pass"),
5) symmetry of step length ("equal" or "unequal").
6) shuffle (present, absent)

6) Tandem Stand and Walk

Equipment: Gait course, laid out as in Figure 1. Stopwatch. Two examiners.

Description: Static tandem balance and ability and time to walk 2 meters placing heel and toe together on a line.

A few Ps will be so unsteady on their feet that the examiner will be concerned for their safety. Since the tandem walk is more difficult to perform than the measured walk, the examiner must exercise extra caution. The Tandem Stand procedures serve as a screening test for the Tandem Walk.

Some Ps who pass the screening test may still want to use a walking aid for the tandem walk. Using an aid should definitely be discouraged as the score will be difficult to interpret. Use of an aid should be recorded on the scoring form. Firmly encourage the P to take as many steps as possible without actually using the cane for support. Do not attempt the test with Ps who want to use a walker. Similarly, if a P wants to hold tight to the examiner or lean steadily on the wall during the test, firmly encourage her to let go and and take as many steps as possible on her own.

I. Tandem Stand (Eyes Open)

Description: Graded series of tests of balance with eyes open and feet in a full tandem semi-tandem, and feet-together positions.

Administration:

1. Full Tandem (Eyes Open)

a) Tell the participant, "This series of tests will assess both the strength in your legs and your balance. I would like you to stand with the heel of one foot in front of and touching the toes of the other foot for about ten seconds.

b) Examiner One should demonstrate the tandem position for the participant. The participant can place the heel of either foot in front of and touching the toes of the opposite foot; whichever is easier. Examiner One stands next to the participant to help her into the tandem position, supplying just enough support to the participant's arm to prevent loss of balance. Tell the participant "You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I say stop."

c) When the participant has her feet in the tandem position, Examiner One asks the participant if she is ready. Then let go and signal Examiner Two to start the timing as you say "Start". Examiner Two stops the stopwatch after 10 seconds or when the subject steps out of position.

d) Record time to the nearest second.

e) If the participant cannot attain the tandem position at all, or cannot hold it long enough to begin timing, score "tried, but unable." GO TO SEMI-TANDEM STAND, EYES OPEN. **DO NOT ATTEMPT THE TANDEM WALK FOR THESE PARTICIPANTS.**

f) If the participant holds the tandem position for 10 seconds, GO TO TANDEM STAND, EYES CLOSED.

g) If the participant holds the tandem stand for less than 10 seconds, GO TO SEMI-TANDEM STAND, EYES OPEN.

2. Semi-Tandem (Eyes Open)

a) Tell the participant, "Now I would like you to try to stand with the side of the heel of one foot touching the great toe of the other foot for about ten seconds."

b) Examiner One should demonstrate the semi-tandem position for the participant. The participant can place the heel of either foot next to the ball of the opposite foot, whichever is easier. Examiner One stands next to the participant to help her into the semi-tandem position. Supply just enough support to the participant's arm to prevent loss of balance. Tell the participant "You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I stay stop".

c) When the participant has her feet in the semi-tandem position, Examiner One asks the participant if she is ready. Then let go and signal Examiner Two to start timing as you say "Start". Examiner Two stops the stopwatch after 10 seconds or when the subject steps out of position.

d) Record time to the nearest second.

e) If the participant cannot attain the semi-tandem position at all, or cannot hold it long enough to begin timing, score "tried, but unable." GO TO SIDE BY SIDE STAND, EYES OPEN.

f) If the participant holds the semi-tandem position for 10 seconds, GO TO TANDEM STAND, EYES CLOSED.

g) If the participant holds the semi-tandem stand for less than 10 seconds, GO TO SIDE BY SIDE STAND, EYES OPEN.

3. Side by Side Stand (Eyes Open)

a) Tell the participant, "Now I would like you to try to stand with your feet together, side by side, for about ten seconds."

b) (If necessary for very frail participants, Examiner One stands next to the participant to help her into the side by side position. Supply just enough support to the participant's arm to prevent loss of balance.) Tell the participant "You may use your arms to maintain your balance, but try not to move your feet. Try to hold this position until I stay stop".

c) When the participant has her feet together, Examiner One signals Examiner Two to start the stopwatch. Examiner Two stops the stopwatch after 10 seconds or when the subject steps out of position.

d) Record time to the nearest second.

e) If she cannot attain the position or hold it long enough to begin timing, THEN STOP. OTHERWISE, GO TO TANDEM STAND, EYES CLOSED.

II. Tandem Stand (Eyes Closed)

Description: Graded series of tests of balance with eyes closed and feet in a full tandem semi-tandem, and feet-together positions.

Administration:

1. Side by Side Stand (Eyes Closed)

   a) Tell the participant, "Now I would like you to try to stand for about ten seconds with your eyes closed and your feet together, side by side."

   b) (If necessary for very frail participants, Examiner One stands next to the participant to help her into the side by side position. Supply just enough support to the participant's arm to prevent loss of balance.) Tell the participant "Try not to move your feet. Try to hold this position until I stay stop".

   c) When the participant has her feet together and her eyes closed, Examiner One signals Examiner Two to start the stopwatch. Examiner Two stops the stopwatch after 10 seconds or when the subject either steps out of position or opens her eyes.

   d) Record time to the nearest second.

   e) If the participant cannot attain the side by side position with eyes closed at all, or cannot hold it long enough to begin timing, score "tried, but unable". THEN STOP. IF THE SUBJECT HOLDS THE POSITION FOR ANY MEASUREABLE TIME, GO ON TO NEXT TEST--SEMI-TANDEM (EYES CLOSED)

2. Semi-Tandem (Eyes Closed)

   a) Tell the participant, "Now I would like you to try to stand for about ten seconds, again with eyes closed, with the side of the heel of one foot against the great toe of the other foot."

   b) (IF necessary, Examiner One should again demonstrate the semi-tandem position for the participant.) Examiner One stands next to the participant to help her into the semi-tandem position. Supply just enough support to the participant's arm to prevent loss of balance.

   c) When the participant has her eyes closed and her feet in the semi-tandem position, and she can hold the position by herself, Examiner One signals Examiner Two to start the stopwatch. Examiner Two stops the stopwatch after 10 seconds or when the subject either steps out of position or opens her eyes.

   d) Record time to the nearest second.

   e) If the participant cannot attain the semi-tandem position with eyes closed at all, or cannot hold it long enough to begin timing, score "tried, but unable". THEN STOP.

   f) If the participant cannot attain the semi-tandem position with eyes closed at all, or cannot hold it long enough to begin timing, score "tried, but unable". THEN

STOP. IF THE SUBJECT HOLDS THE POSITION FOR ANY MEASUREABLE TIME, GO ON TO NEXT TEST–TANDEM (EYES CLOSED)

3. Full Tandem (Eyes Closed)

a) Tell the participant, "Now, I would like you to stand, again with your eyes closed, with the heel of one foot in front of and touching the toes of the other foot for about ten seconds. Just like you did before".

b) (If necessary, Examiner One should again demonstrate the tandem position for the participant.) Examiner One stands next to the participant tohelp her into the tandem position, supplying just enough support to the participant's arm to prevent loss of balance. Tell the participant "Try not to move your feet. Try to hold this position until I say stop."

c) When the participant has her feet in the tandem position and her eyes are closed, Examiner One asks the participant if she is ready. Then signal Examiner Two to start the stopwatch as you say "Start". Examiner Two stops the stopwatch after 10 seconds or when the subject steps out of position or opens her eyes.

d) Record time to the nearest second.

e) If the participant cannot attain the tandem position at all, or cannot hold it long enough to begin timing, score "tried, but unable."

f) GO TO TANDEM WALK.

III. Tandem Walk

NOTE: Do not attempt the tandem wald if the participant could not attain the full tandem position with eyes open and without assistance.

Administration:

a) Explain to the participant "Now I'm going to ask you to do something which some people find easier than trying to balance while standind still and other people find a little more difficult. I want you to walk on this line as though walking a tightrope (or performing a drunk-driver test.)"

b) Demonstrate the tandem walk for the participant. As you demonstrate say, "Keep your feet on the line with the heel of the foot in front touching the toe of the foot behind. You can move your arms to help keep your balance. If you have to steady yourself by stepping off the line or reaching out for the wall or the examiner, that's OK. Steady yourself and then keep going. I'll be walking next to you and will time you to see how long it takes to walk all the way to the end."

c) Position the participant at the starting line. Ask her try 2 or 3 practice steps. Encourage her to touch heel and toe together on every step. When she is back in proper position say, "Remember, I will be right here next to you to help if you

loose your balance. You may begin when you are ready."

d) Examiner One should guard the P closely, time her with the stopwatch, and count the number of times she reaches out and touches the wall or the examiner for support. Start the stopwatch when she first puts her foot on the line and stop it when the foot first goes over the end of the line.

Examiner Two counts the number of times the subject steps off the line and the number of steps taken without heel touching toe. Examiner Two should encourage participants to touch heel and toe.

e) If the P wants to give up before reaching the end, encourage her to continue. "Even if you can't stay on the line or keep your heel and toes together on every step, continue trying to walk the line, placing your heel and toe together on the line as often as possible until you reach the end of the red line. It is important to continue to move along the line, even if you can't stay on it very well."

f) Record:

i) the number of times the P steps off the line (the entire foot is off the line),

ii) the number of times she does not touch the heel and toe together,

iii) the number of times she touches the wall or examiner for support,

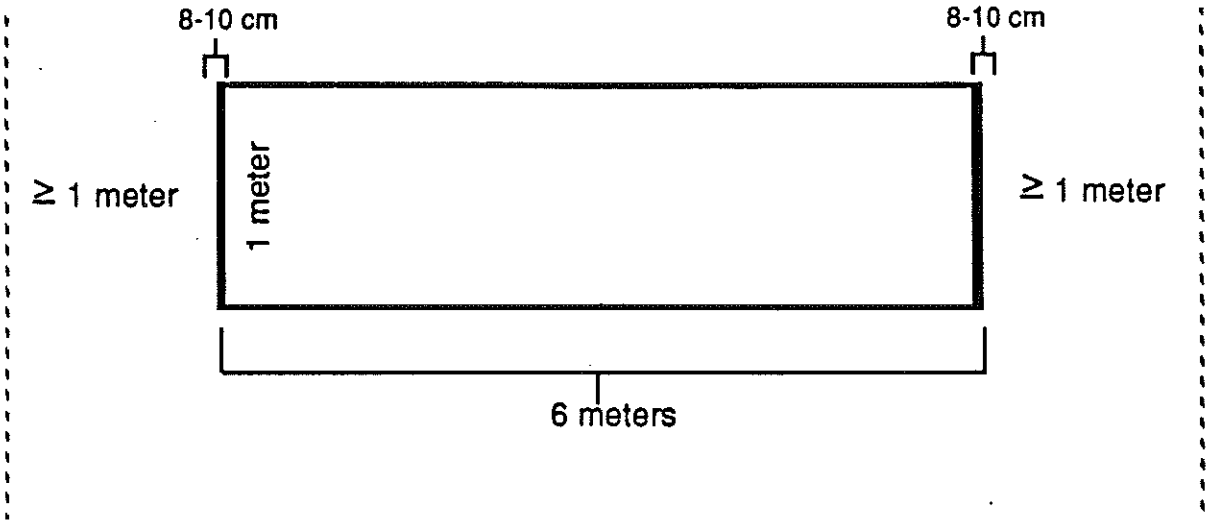
iv) whether the course is completed, and

v) the time from beginning to completion (or last step attempted) to the nearest tenth of a second.

Special circumstances: If the P uses a cane during the test, count each step in which external support is used as a "step off". Be sure to record that a cane was used.

If the P holds tight to the examiner or leans steadily on the wall after being encouraged to let go, then count each step taken while holding on as a "touch". If she holds on the entire length of the line, record this on the scoring form.

Walking Course



Tandem Walk Line

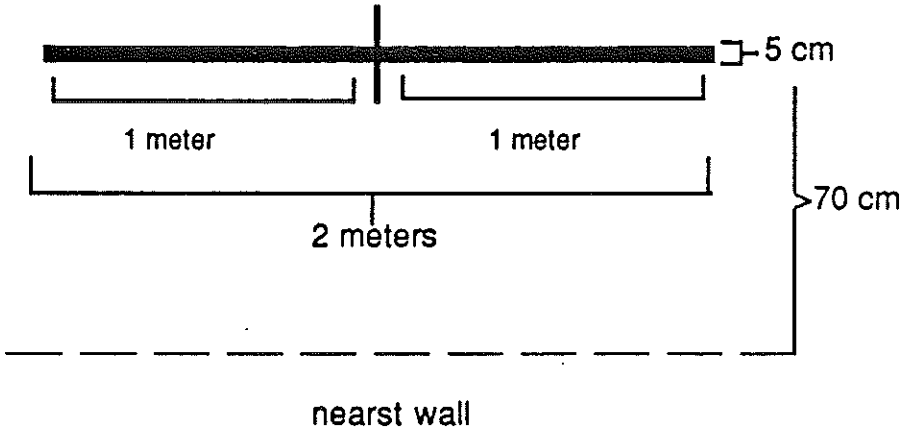


Figure 1

SOF Memorandum #98

October 1, 1987

To: SOF clinic directors, coordinators and staff

From: Michael C. Nevitt, SOF Coordinating Center

Re: Mid-study quality control site visits

Thank you all very much for your hospitality during my recent visits. It was a pleasure to spend more time at each of the clinics and get to know you and your operations a little better.

I am quite impressed with the good job everyone is doing, how smoothly the baseline visits are going and how professional all the clinic operations are. The recruitment news also continues to be good. **By early October we will have passed the halfway mark in recruitment!** I think we all deserve to be congratulated!

The few remaining rough spots in the protocol are reviewed below, along with a number of protocol items that I am just obsessive-compulsive about, and some new ideas about other items. Everyone involved in data collection should review these comments thoroughly.

I. Some general principles which can help maintain adherence to the protocol.

1) Participants perform best when they have a clear understanding of what they are expected to do. It can be disconcerting for them to have to repeat a procedure they didn't understand. In addition, the amount of variation in the way procedures are described to participants probably exceeds what is good for standardization.

- Demonstrations are worth a thousand words. Demonstrate all procedures to participants as you explain.

- At least once a week, read aloud the scripts which accompany the procedures, preferably while doing a real participant. It is easy to forget important details.

- For all tests that involve speed (stand-ups from chair, rapid step-ups on stool, foot taps), be sure the participant understands she is to perform as rapidly as she can.

2) Ongoing protocol review is essential, since the habitual techniques we develop often drift away from what is optimal.

• Read sections of the protocol manual on a regular basis, and consult it whenever you have a question. It is not exciting reading to be sure, but it is full of essential detail.

• When possible, observe one another doing a participant. Monthly protocol reviews might focus on a particular section of the exam or questionnaire, designated in advance so that you can develop a list of problems and unusual situations.

• Keep lists of questions about technique, interpretation of questions and coding. If you can't resolve the questions locally, consult with someone at the Coordinating Center. If you develop an approach that you feel is an improvement on the original protocol, please talk it over with us before making it standard practice. It may be something that all the clinics should be doing.

II. Some specific protocol issues.

1) **Tandem stand sequence.** A participant shouldn't be given multiple chances to attain and hold the position. (In real life, we usually don't get a second chance to avoid a fall.) The examiner should be in control of when the trial and timing begins. The best way to do this is to stand beside and a little bit in front of the participant (so you can watch her eyes). After explaining and demonstrating the position, hold her forearm with your left hand (stopwatch behind her in right hand) until she attains equilibrium and appears to be in a stable position. Hold each participant in a stable position for about 3 seconds. The amount of support you provide will depend on the participant. For many, you will be holding them very lightly, providing almost no support. Gradually reduce the amount of support you are providing, then say: "I'm going to let go now. OK, begin." and let go. Let go gently and start the stopwatch. As soon as she grabs you or something else, or moves out of position, the trial is over.

2) **Limb strength testing with dynamomter. We need to take special care to ensure the reproducibility of these tests!**

As we discussed during my visits, be sure to keep the following pointers in mind:

a) Tuck your elbow into your pelvis and use your whole body (musculature and weight) to overcome the subject's resistance. (It helps me to rotate my body about 45 degrees toward the direction I am pushing.) This procedure stabilizes the dynamometer and should result in much more reproducible measurements. Also, stabilize the dynamomter and/or your wrist with the other hand.

b) Avoid explosive movements by building up gradually to maximum force. Tell her that first "When I push against your [limb], hold your [limb] there, don't let me push your [limb] back." Build up gradually to where you are pushing fairly hard (about 3 or 4 seconds), but don't push her limb back yet. NOTE: For the knee strength test, achieving isometric equilibrium with the examiner may be easiest if you instruct her to keep her knee bent just a few degrees greater than 90 (i.e. out away from the table a few extra degrees).

c) After you are pushing fairly hard without pushing the limb back, say "Now push, push, push as hard as you can." Let her build up to maximum strength (about 3 seconds) before you push her limb back. As soon as you move her limb back a couple of inches, then stop.

If you push the leg back too far you may begin to inappropriately increase the score by pushing against the exam table.

There are problems with the reproducibility of the limb length measurements. Please collectively review the length measurement techniques at the earliest opportunity. NOTE: Knee length is best measured with the knee flexed to 90 degrees, since the knee joint line is hard to find with the leg straight. For standardization, measure to the distal edge of the lateral maleolus (ankle bone) for the knee and leg length measures. The forearm length is measured with the elbow bent to 90 degrees and the palm of the hand toward the feet.

Practice achieving convergent scores for length and kilograms for several examiners on the same (real) participant.

If a participant answers "yes" to the question about one side being weaker than the other, but does not want to perform the strength testing on a limb because of a recent injury or surgery (e.g. mastectomy), test strength on both sides for the uninjured limbs (e.g. legs) and enter code for "refused" for the relevant side of the injured limb (e.g. right arm).

3) **Waist and hip girths.** The best position for the examiner is seated, facing the participant. Palpate the bony landmarks to determine the correct tape position. Be sure you have located the bony landmarks correctly before placing the tape. After placing the tape, always make sure it is in the same horizontal plane all the way around, and is not riding up in back (a problem primarily for the hips). If necessary, get someone to look at the tape for you.

For the waist measurement, the natural waist line (narrowest part of the waist by observation) is not necessarily the same as the midpoint between the two bony landmarks (iliac crest, or top of the pelvis, and the lowest edge of the rib cage). For women with protuberant abdomens, the natural waistline may be quite a bit higher than the correct position for the tape.

For the hip girth, please note that placing the tape "At what appears to be the widest point around the hips" is only an option for the occasional participant on whom you can't palpate the trochanters. Admittedly, this alternative is vague and should be used infrequently. If you must use it, interpret it to mean the widest diameter across the hips when viewed from the front.

4) **Contrast sensitivity.** Don't stop when participant gets one wrong. Go all the way through the row. If she says "The rest look blank", then its OK to stop.

5) **Howard Dolman.** Bring the participant right up to the box to demonstrate how it works and explain what you want her to do. Let her pull on the strings while she is up close. Be sure she understands that she can move the pegs in both directions by pulling on opposite strings. Guard against side to side head movements during the test.

6) **Acuity.** Watch for the participant who wants to lean way forward in the chair to see better.

7) **Randot** (near depth perception). It might be a good idea to position yourself and the participant so that you can point to the correct box with a pencil or pointer.

One clinic reports that some participants get number 7 wrong, but then rush on to 8, 9 and 10 and get them correct. If you notice this problem, let me know. Unless the participant just mispoke on number 7, however, the correct score would still be 6 in this case.

8) **Height measurement.** By now you should all be using the new stadiometer. Please inform the Coordinating Center of the ID number of the first participants to use the new Harpenden.

Watch for slippage in the counter of the new stadiometer (possibly caused by a loose screw on the counter). Calibrate the stadiometer against the 600 mm rod at least daily. You might consider mounting the tape from the old stadiometer (be sure the side starting with zero at the very end of the tape is facing forward) on the backboard of the new one as both an appoximate calibration check and for conversion of centimeters to inches.

9) **Usual walk.** For many participants, armswing cannot be accurately evaluated unless you are able to view the participant from the side in order to determine whether you can see daylight between the hand and the body.

10) **Tandem walk.** Remember to demonstrate! Your demonstration technique should serve to emphasize that if she steps off the line she should step back on and keep going. Be on the lookout for that surreptitious elbow on the wall that is used to gain stability. This counts as a touch! Also, be careful scoring "holds on most or all of way?" and "completes half or more of course?". A "yes" on the former implies poor balance while a "no" on the latter implies poor balance. I'm afraid it's too late to change the form.

11) **Questionnaire items.**

- **Social Security and Medicare Numbers.** Some participants are in Medicare and Social Security by virtue of being in the Federal Railroad Retirement System. The SS and Medicare number of these persons looks different from the others by having several trailing and leading letters. Record the full number including all letters. These numbers should be sent to the Coordinating Center for entry. (Send a copy of the questionnaire page.)

- **Passive smoking.** The objective is to determine the subject's exposure to someone else's smoking. Be wary of the participant who seems to be telling you about how much her husband smoked altogether, rather than how much he smoked in the home while she was there.

• **Dietary.**

For portion sizes that are more or less than medium, probe for "about 1/2 more" or "about 1/2 less". If her portion is 2 or more times greater or less than the medium, then you will need to adjust the frequency in order to record the correct volume of consumption.

Count frozen yogurt as yogurt, not ice cream.

Be sure to tell participant that chicken model is all meat, no bone.

If participant reports periodically buying a food in a specific quantity (i.e. a large bag of cookies every month) but can't tell you how much and how often she eats it, determine the number of portions in the amount purchased (e.g. about 20 two cookie medium portions) and record as number of portions per time period (i.e. cookies, medium portion, 20 times per month. If she shares the food with spouse, etc., you will also need to determine what proportion of the periodic quantity she consumes.

• **Physical activity.**

Yard work is coded as gardening (code 25).

For activities as a teenager, be sure she doesn't start telling you about everything she did as a child.

A good technique for the physical activity history is to go through questions 59 to 62 filling in the types of activity first, then go back and ask about frequencies for each type of activity at different ages. That way, if the participant has done an activity at several ages, you can ask about frequency at different ages in sequence. This improves the flow. For example, "How often did dance at age 50? At age 30? When you were a teenager?"

Stairways. Question 71a measures the number of times a person goes down a stairway on a typical day (an exposure to fall risk). It does not matter how many flights or steps are in the stairway. Each encounter counts as 1. Question 71b measures the number steps she goes up each day (a physical activity measure). You can derive b from a by asking: "Each time you go down a stairway, do you usually also make a trip up the stair?" After determining the number of times she goes up stairways on a typical day, find out how many steps are in each stairway.

• **Back problems and functional status.**

For quesitons 73-78, difficulty with an activity is to be attributed to back pain or back problems, <u>not</u> to hip pain or hip problems. If back pain or problems <u>contribute</u> to difficulty, then mark the clinic use box 'yes', even though other factors may also contribute to the difficulty.

If someone says they don't do an activity or have difficulty with an activity because they are afraid of the consequences of doing so (e.g. don't walk three blocks because muscles will get stiff afterward, or don't lift something because back will hurt afterward), then the limitation or difficulty is attributable to a health problem.

Also, an aftereffect of doing an activity, such as pain or stiffness, counts as a difficulty with doing the activity.

• **Medications.**

For each medication checked "Yes" on the take-home, confirm by repeating the question as worded, with emphasis on such modifiers as "**pills**" or "**at least once a week**" or "**every day or almost every day**". Also, for data about length of time a drug is used, be sure to get the time when the drug was actually being taken as specified in the question (i.e. "at least once a week" "everyday or almost everyday").

Check for consistency between certain medications and medical conditions, i.e. steroids for rheumatoid arthritis and rheumatoid arthritis.

Estrogen vaginal creams and suppositories. Some women may mistakenly report the use of antibiotic suppositories for treatment of vaginitis as an estrogen suppository. The former can be differentiated from estrogen suppositories by:

a. Probing for uses of the suppository (page 64 of questionnaire manual).
b. Probing for use pattern. Antibiotic suppositories are generally given in pulse doses (e.g. take for two weeks and then stop altogether), while estrogen suppositories are taken over much longer periods of time.
c. Obtaining the name of the suppository and checking it against the list in the coding chapter.

Be careful, though. Estrogen and antibiotic suppositories are occasionally prescribed at the same time, since atrophic vaginitis increases the risk of infection. In this case, the estrogens are usually continued after the antibiotics are stopped.

Also, testosterone creams are sometimes prescribed for atrophic vaginitis. The best way to differentiate these from vaginal creams is by name, since the pattern of use is often similar.

12) **Miscellaneous.**

• **Elbow breadth.**

You may want to tell your participants whether they have a SMALL, MEDIUM OR LARGE frame size, based on the elbow breadth measurement. For white females age ≥ 65:

SMALL ≤ 60 mm

MEDIUM = 60 - 68 mm

LARGE ≥ 69 mm

• **Osteon results.**

Baltimore and Pittsburgh have developed forms (attached) for reporting bone density to participants. You may want to do something similar, if you haven't already.

• **Determining x-ray side for hand.**

To ensure that the hand x-ray is done on the same side as the forearm bone density measurement, it is probably best (least prone to error) if the side to be x-rayed is determined by the SOF clinic before sending the participant to x-ray, instead of relying on the x-ray tech to determine the side based on the SOF algorithm.

If you have any questions about any of the above , please call.

Thanks again for the pleasant visits.