

INTERPRETATION OF PERFORMANCE

The goal of mobility screening is to identify those with preclinical mobility limitation (PCML: subtle changes in performance that are precursor to mobility limitation and future disability) at a time that wellness intervention may improve/preserve function.

The following charts facilitate interpretation of a screening participant's performance on each of the tests/measures used in the screening protocol. They are based on reference values (mean and standard deviation) by age and gender reported in the recent research literature.

- The 1st column contains the **reference value** by age and gender
- The 2nd column (shaded green) contains the **threshold value** that indicates low likelihood of Pre-Clinical Mobility Limitation (No PCML)
- The 3rd column (shaded yellow) contains the threshold value that indicates PCML is present.
- The 4th column (shaded red) is the **threshold value** that indicates clinically apparent Mobility Limitation (ML) is present
- **NOTE:** the validity of these values will be evaluated as data from screenings becomes available.

To use the charts to determine categorization for each test/measure

- select the **ROW** corresponding to the participant's **AGE** category.
- Select the **column closest in value** to the participant's **performance value** (be sure to review all columns)
- Write the age/gender reference value and participant performance value on the participant report card. Mark the bar chart where you estimate participant's performance to lie.

NOTE: \geq means greater than or equal to \leq means less than or equal to

- **For walking speed:** slow speed = poor performance
- **For 30 Sec. Chair Stand:** less repetitions = poor performance
- **For Four Square Step Test and TUG:** greater time = poor performance

Examples using Self Selected Walking Speed

Participant A is a 78 year old woman. Her self-selected/usual walking speed is 0.99 m/sec

- Reference value for 70-79 year old women is 1.12 (0.20) m/sec
- Threshold for women 70-79 with low likelihood of PCML is > 1.03 m/sec
- Threshold for women 70-79 with PCML is ≤ 1.02 m/sec
- Threshold for women 70-79 with actual ML is 0.92 m/sec
- Her performance is slower than PCML threshold, and faster than ML threshold: she is positive for PCML based on usual walking speed

Participant B is a 91 year old man. His self-selected/usual walking speed is 0.87 m/sec

- Reference value for 90+ year old men is 0.91 (0.17) m/sec
- Threshold for 90+ year old men with low likelihood of PCML is 0.83 m/sec
- Threshold for 90+ year old men with PCML is
- Threshold for 90+ year old men with actual ML is
- His performance is faster than the low likelihood threshold; he is negative for PCML based on usual/comfortable walking speed

Participant C is a 67 year old woman. Her self-selected walking speed is

- Reference value for 60-69 year old women is 1.22 (0.16) m/sec
- Threshold for 60-69 year old women with low likelihood of PCML is
- Threshold for 60-69 year old women with PCML is
- Threshold for 60-69 year old women with actual ML is
- Her performance is slower than thresholds for all three categories; she is positive for actual mobility limitation based on usual/comfortable walking speed

CHARTS FOR MEN

SELF SELECTED/USUAL WALKING SPEED (m/sec)

Fall Risk: < .76 m/sec (Sn .65, Sp .71)^a

Frailty Risk: < .63 m/sec (Sn .90, Sp .90)^b

Age Group	Men			
	Reference Mean (SD)	No PCML	PCML	ML
50-59 ^c	1.31 (.16)	≥ 1.23	≤ 1.22	≤ 1.15
60-69 ^d	1.27 (.17)	≥ 1.19	≤ 1.18	≤ 1.10
70-79 ^d	1.18 (.20)	≥ 1.09	≤ 1.08	≤ .98
80-89 ^d	1.02 (.20)	≥ .93	≤ .92	≤ .82
≥ 90 ^d	.91 (.17)	≥ .83	≤ .82	≤ .74

FAST WALKING SPEED (m/sec)

FALL RISK: < .110 m/sec^a (Sn .76, Sp .60)^a

Age Group	Men			
	Reference Mean (SD)	No PCML	PCML	ML
50-59 ^c	1.33 (.55)	≥ 1.26	≤ 1.25	≤ .78
60-69 ^d	1.40 (.30)	≥ 1.26	≤ 1.25	≤ 1.10
70-79 ^d	1.58 (.51)	≥ 1.34	< 1.33	≤ 1.07
80-89 ^d	1.36 (.38)	≥ 1.18	≤ 1.17	≤ 0.98
≥ 90 ^d	1.19 (.32)	≥ 1.04	≤ 1.03	≤ 0.87

30 Sec. CHAIR STAND (# of repetitions)

(Fall risk last column in chart)

Age Group	Men				Fall Risk ^f
	Reference Mean (SD) ^e	No PCML	PCML	ML	
50-59	13.9 (3.9)	≥ 12	10,11	10	?
60-69	20.2 (4.9)	≥ 18	16,17	15	< 11
70-79	14.0 (5.8)	≥ 11	9, 10	8	< 10
80-89	9.1 (6.1)	≥ 7	6	3	< 8
90+	9.1 (4.2)	≥ 7	6	5	< 4

FOUR SQUARE STEP TEST (sec)

Multiple Fall Risk ≥ 15 sec (Sn .85, Sp .88)^g

Age Group	Men			
	Reference Mean SD ^e	No PCML	PCML	ML
50-59	10.2 (3.3)	≤ 11.8	> 11.9	≥ 13.5
60-69	9.4 (1.9)	≤ 10.3	≥ 10.4	≥ 11.3
70-79	10.9 (4.2)	≤ 12.9	≥ 13.0	≥ 15.1
80-89	15.8 (8.0)	≤ 19.7	≥ 19.8	≥ 23.8
90+	13.0 (3.4)	≤ 14.6	≥ 14.7	> 16.4

TIMED UP AND GO

Fall Risk. > 12.0 sec. (Sn .74, Sp .31)^h

Fall Risk > 80 yrs > 12.0 sec. (Sn .78, Sp .52.)ⁱ

Frailty ≥ 17.8 sec. (Sn .93, Sp .98)^b

Age Group	Men			
	Reference Mean SD ^e	No PCML	PCML	ML
50-59 ^c	7.5 (1.5)	≤ 8.3	≥ 8.4	≥ 9.0
60-69	10.6 (6.4)	≤ 13.8	≥ 13.8	≥ 17.0
70-79	8.6 (2.8)	≤ 10.0	≥ 10.1	≥ 11.4
80-89	11.5 (3.6)	≤ 13.3	≥ 13.4	≥ 15.1
90+	13.4 (6.9)	≤ 16.9	≥ 17.0	≥ 20.3

TUG Dual Task (Cognitive)

Fall Risk > 15 sec. (Sn 1.00, Sp .66)^j

Age Group	Men			
	Reference Mean SD ^e	No PCML	PCML	ML
50-59 ^c	10.1 (2.1)	≤ 11.2	≥ 11.3	≥ 12.2
60-69	13.2 (7.3)	≤ 16.7	≥ 16.8	≥ 20.5
70-79	11.6 (4.1)	≤ 13.5	≥ 13.6	≥ 15.7
80-89	16.2 (6.6)	≤ 19.4	≥ 19.5	≥ 22.8
90+	20.2 (9.6)	≤ 24.9	≥ 25.0	> 29.8

CHARTS FOR WOMEN

SELF SELECTED/USUAL WALKING SPEED (m/sec)

Fall Risk: < .76 m/sec (Sn .65, Sp .71)^a

Frailty Risk: < .62 m/sec (Sn .90, Sp .90)^b

Age Group	Women			
	Reference Mean (SD)	No PCML	PCML	ML
50-59 ^c	1.26 (0.17)	≥ 1.18	≤ 1.17	≤ 1.09
60-69 ^d	1.22 (0.16)	≥ 1.15	≤ 1.14	≤ 1.06
70-79 ^d	1.12 (0.20)	≥ 1.03	≤ 1.02	≤ 0.92
80-89 ^d	0.98 (0.21)	≥ 0.89	≤ .88	≤ 0.77
≥ 90 ^d	0.76 (0.21)	≥ 0.66	≤ .65	≤ 0.55

FAST WALKING SPEED (m/sec)

FALL RISK: < .1.10 m/sec (Sn .76, Sp .60)^a

Age Group	Women			
	Reference Mean (SD)	No PCML	PCML	ML
50-59 ^c	1.67 (0.51)	≥ 1.60	≤ 1.59	≤ 1.16
60-69 ^d	1.59 (0.37)	≥ 1.42	≤ 1.41	≤ 1.22
70-79 ^d	1.52 (0.33)	≥ 1.37	≤ 1.36	≤ 1.19
80-89 ^d	1.20 (0.33)	≥ 1.05	≤ 1.04	≤ 0.87
≥ 90 ^d	1.02 (0.27)	≥ 0.90	≤ 0.89	≤ 0.75

30 Sec. CHAIR STAND

(fall risk in table)

Age Group	Women				
	Reference Mean (SD) ^e	No PCML	PCML	ML	Fall ^f Risk
50-59	14.3 (6.9)	≥ 12	8 -11	≤ 7	?
60-69	13.4 (4.1)	≥ 12	10-11	≤ 9	< 11
70-79	11.6 (5.3)	≥ 10	7 - 9	≤ 6	< 10
80-89	9.7 (4.2)	≥ 9	7 - 8	≤ 6	< 8
90+	8.6 (3.7)	> 8	6 - 7	≤ 5	< 4

FOUR SQUARE STEP TEST

Multiple Fall Risk ≥ 15 sec (Sn .85, Sp .88)^g

Age Group	Women			
	Reference Mean SD ^e	No PCML	PCML	ML
50-59	10.3(4.7)	≤ 12.6	≥ 12.7	≥ 15.0
60-69	9.7 (2.4)	≤ 10.8	≥ 10.9	≥ 12.1
70-79	10.9 (3.6)	≤ 12.6	≥ 12.7	≥ 14.5
80-89	14.9 (5.7)	≤ 17.6	≥ 17.7	≥ 20.6
90+	20.0 (16.7)	≤ 28.2	≥ 28.3	≥ 36.7

Timed Up and Go

Fall Risk > 13.5 sec^a (Sn .74, Sp .31)^h

Fall Risk > 80 yrs > 12.0 sec. (Sn .78, Sp .52.)ⁱ

Frailty ≥ 17.8 sec. (Sn .93, Sp .98)^b

Age Group	Women			
	Reference Mean SD ^e	No PCML	PCML	ML
50-59 ^c	8.7 (3.3)	≤ 10.4	≥ 10.5	≥ 12
60-69	8.1 (1.8)	≤ 9.0	≥ 9.1	≥ 9.9
70-79	9.2 (2.7)	≤ 10.6	≥ 10.7	≥ 11.9
80-89	11.4 (3.0)	≤ 12.9	≥ 13.	≥ 14.4
90+	14.7 (6.3)	≤ 17.9	≥ 18.0	≥ 21.0

Timed Up and Go Dual Task (Cognitive)

Fall Risk > 11 sec. (Sn 1.00, Sp .66)^j

Age Group	Women			
	Mean SD ^e	No PCML	PCML	ML
50-59	11.9 (5.9)	≤ 14.9	≥ 15.0	≥ 17.8
60-69	13.0 (5.0)	≤ 15.4	≥ 15.5	≥ 18.0
70-79	12.9 (5.0)	≤ 15.3	≥ 15.4	≥ 17.9
80-89	17.3 (4.7)	≤ 19.5	≥ 19.6	≥ 22.0
90+	24.3 (10.2)	≤ 29.3	≥ 29.4	≥ 34.5

**Minimal Detectable Change/Difference Values
for Mobility Screening Measures: mean (95% Confidence Interval)**

Measure	MDC Value Community Living (95%CI)
Self-selected Walking Speed (m/sec)	0.05 m/sec ^k
Fast Walking Speed (m/sec)	0.09 m/sec ^l
30 sec. Chair Rise (repetitions)	0.9 repetitions ^m
Four Square Step Test (sec)	Not yet reported
Timed Up and Go (seconds)	1.0 sec ⁿ
TUG Dual Task Cost (comparing TUG to TUG-DT cognitive)	Change of 41% from than TUG time ^o

Interpretation:

Change in performance (increase or decrease) at the reported level is thought to be beyond measurement error, and potentially meaningful.

References

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