Telehealth Friendly Neuro Assessment Tools

A guide for students

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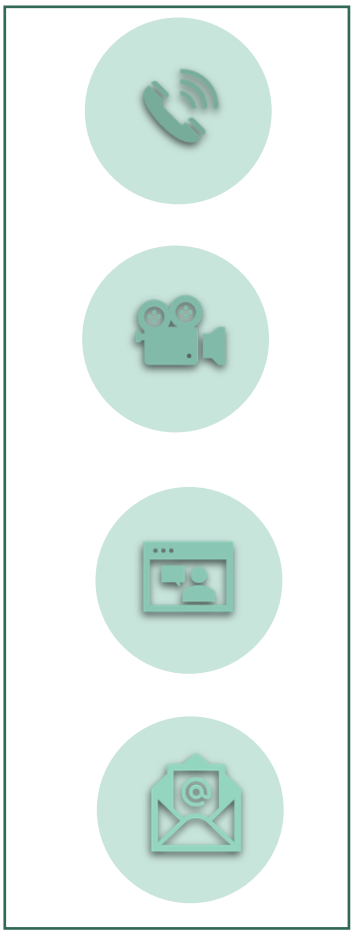

2020

Table of Contents

Welcome

The aim of the Telehealth Friendly Neuro Assessment Tools guide is to provide you a list of outcome measures and their administration techniques that ***may be*** feasible to administer in a remote or telehealth environment.

General Consideration for Remote Neuro Assessment Administration:

- Consider the risk of adverse events or deterioration in the client's condition.
- Consider the impact of any pre-existing disability and fatigue levels.
- Consider environmental safety risks at the client's location and how these can be mitigated. For example, have a client set-up close to a table/kitchen bench when conducting dynamic balance tests.
- Consider having a family member or carer is physically present and properly positioned during the assessment if required to ensure the client's safety and reliable data collection. For example, while conducting the Functional Reach Test, have a family member/caregiver available to position the camera and mark the reaching distance.
- Allow plenty of time for initial set up and assessment as it may take longer to communicate the instructions and demonstrate the assessment tasks using a telehealth platform.

Checklist

Before Assessment

There are several fundamental points that you should ensure you have covered before you begin any patient interaction. These should be tailored to the patient and situation.

- ☑ Explain the assessment purpose (in a manner that can be understood)
- ☑ Ensure you are familiar with and have practiced the assessment
- ☑ Give the patient sufficient time and instructions to gather any equipment and set up for the assessment

During and After Assessment

- ☑ Maintain appropriate test administration standards, such as a quiet environment with limited noise and distractions
- ☑ Ensure you communicate your findings and proposed next steps with your patient

Note: Use this supplementary checklist in conjunction with the detailed checklist from Neuro Toolbox (Page 6).

Outcome Measures

Activity

Balance

Functional Reach Test/ Modified Functional Reach Test	
Purpose	Motor performance assessment tool for static balance assessing the maximum distance a participant can reach forward while standing in a fixed position. Modified Functional reach Test is adapted for people who are unable to stand.
ICF Domain	Activity
Equipment	Patient: Yardstick, Duct tape (to tape the yardstick to the wall)
Test Description	• 3- trials are done and the average of the last two is noted • The modified FRT requires the individual to sit in a fixed position.
Population	Parkinson's Disease Stroke Spinal Cord Injury Vestibular disease Older adults
Test Administration & Scoring	Here Example video: Functional Reach Test
Clinimetric properties (MDC/MDIC)	Acute Stroke: 3.7cm Sub-acute stroke: 6.79cm Parkinson's Disease: 9cm
Normative data [Mean (SD)]	Stroke = 25.6 (7.4)cm Stroke (Modified FRT) = 37.6 (5.2)cm Parkinson's Disease = 33.54 (7.36)cm
Cut-off Score	For Parkinson's disease: <31.75cm indicates falls risk (Dibble & Lange, 2006) Community-Dwelling Elderly: <17.78cm indicates inability to leave neighbourhood without help, limited mobility skills, and most restrictions in ADLs Likelihood of falling (not specific to any condition): If unable to reach/attempt = 8x more likely If reaches < 15.24 = 4x more likely If reaches 15.24-25.4cm = 2x more likely If reaches > 25.4cm = unlikely to fall
Resource	FRT

References:

Dibble, L., & Lange, M. (2006). Predicting falls in individuals with Parkinson Disease. *Journal of Neurologic Physical Therapy, 30*(2), 60-67.

Lim, L., van Wegen, E., de Geode, C., Jones, D., Rochester, L., Hetherington, V., Nieuwboer, A., Willems, A., & Kwakkel, G. (2005). Measuring gait and gait-related activities in Parkinson's patients own home environment: a reliability, responsiveness and feasibility study. *Parkinsonism & Related Disorders, 11*(1), 19-24.

Katz-Leurer, M., Fisher, I., Neeb, M., Schwartz, I., & Carmeli, E. (2009). Reliability and validity of the modified functional reach test at the sub-acute stage post-stroke. *Disability and Rehabilitation, 31*(3), 243-248.

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Postural Assessment Scale for Stroke Patients (PASS)		
Purpose	A motor performance assessment tool for postural control, mobility, balance, and ability to maintain equilibrium during positional changes.	
ICF Domain	Activity	
Equipment	Assessor	Stopwatch
	Patient	Standard Bed, Chair
Test Description	• The test consists of 12 items with increasing difficulty which measure balance in lying, sitting, and standing. • It is especially sensitive for assessment of postural control within the first 3 months post-stroke and can discriminate between right and left brain damage. • It consists of a 4-point scale where items are scored from 0 to 3 with total score ranges from 0 to 36. • Consider safety issues post-stroke and exercise caution when administrating the measure. • User Discretion is advised: Some tests may not be appropriate depending on cognition, safety, materials, and/or another individual willing to help out at home.	
Population	Stroke Older adults	
Test Administration & Scoring	Here	
Psychometric properties (MDC/MDIC)	Internal Consistency: Cronbach's alpha = 0.94-0.96 (14,30,90,&180 days post-stroke) Test-retest reliability: ICC = 0.84 Inter-rater reliability: ICC = 0.97 Minimal Detectable Change (MDC): Acute Stroke = 1.8 (1.7)points; Chronic stroke: 3.2 points Concurrent validity: with BBS *p*= 0.92-0.95 Moderate ceiling effects: range = 3.3-17.5%	
Normative data [Mean (range)]	Healthy older adults = 35.7 (range: 32-36) points	
Cut-off Score	Indicative of independent ambulatory capacity: Static PASS = 3.5 points Dynamic PASS = 8.5 points Total Pass = 12.5 points	
Resource	PASS	

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Benaim, C., Pérennou, D., Villy, J., Rousseaux, M., & Pelissier, J. (1999). Validation of a Standardized Assessment of Postural Control in Stroke Patients: The Postural Assessment Scale for Stroke Patients (PASS). *Stroke, 30*(9), 1862-1868. https://doi.org/10.1161/01.STR.30.9.1862

Chien, C., Hu, M., Tang, P., & Sheu, C. (2006). A Comparison of Psychometric Properties of the Smart Balance Master System and the Postural Assessment Scale for Stroke in People Who Have Had Mild Stroke. *Archives of Physical Medicine and Rehabilitation, 88*(3), 374-380. https://doi.org/10.1016/j.apmr.2006.11.019

Hsueh, I., Chen, K., Chou, Y., Wang, Y., & Hsieh, c. (2013). Individual-Level Responsiveness of the Original and Short-Form Postural Assessment Scale for Stroke Patients. *Physical Therapy*, *93*(10), 1377–1382. https://doi.org/10.2522/ptj.20130042

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Liaw, L., Hsieh, C., Hsu, M., Chen, H., Lin, J., & Lo, S. (2012). Test–retest reproducibility of two short-form balance measures used in individuals with stroke. *International Journal of Rehabilitation Research, 3*5(3), 256-262. https://doi.org/10.1097/MRR.0b013e3283544d20

Mao, H., Hsueh, I., Tang, P., Sheu, C., & Hsieh, C. (2002). Analysis and comparison of the psychometric properties of three balance measures for stroke patients. *Stroke, 33*(4), 1022-1027. https://doi.org/10.1161/01.STR.0000012516.63191.C5

Berg Balance Scale/ Short Form Berg Balance Scale – 3 point		
Purpose	A motor performance assessment tool for static and dynamic balance as well as falls risk.	
ICF Domain	Activity	
Equipment	Assessor	Stopwatch
	Patient	Average height chair with armrest, Average height chair without armrest, Ruler, slipper or a Shoe, Average height step or stool
Test Description	• The test comprises of 14 items with varying difficulty of static and dynamic balance activities. • It consists of a 5-point scale where items are scored from 0 to 4 and total score ranges from 0 to 56. • Short-form BBS consists of 7 items with a 3-point scale where items are scored from 0-4 (0, 2, & 4 scored from original BBS) with total score ranges from 0 to 28. • Consider safety issues and exercise caution when administrating the test. • User Discretion is advised: Some tests may not be appropriate depending on cognition, safety, materials, and/or another individual willing to help out at home.	
Population	Stroke Parkinson's Disease Spinal Injuries Brain Injury Vestibular Disorders	
Test Administration & Scoring	Here	
Clinimetric properties (MDC/MDIC)	Acute Stroke: 6.9 points Chronic stroke: 4.66 points Parkinson's Disease: 5 points	
Normative data [Mean (SD)]	Parkinson's Disease (community dwelling) = 46(7) points Community Dwelling Elderly people: 60-69yrs = Male 55(1); Female 55(2) 70-79yrs = Male 54(3); Female 53(4) 80-89yrs = Male 53(2); Female 50(3)	
Cut-off Score	41 -56: Low fall risk/ Independent 21-40: Medium fall risk/ walking with assistance 0-20: High fall risk/ walker or wheelchair-bound	
Resource	BBS	

References:

Berg, K., Wood-Dauphinee, S., Williams, J., & Maki, B. (1992). Measuring balance in the elderly: validation of an instrument. Can J Public Health, 83(2), S7-11.

Brusse, K., Zimdars, S., Zalewski, K., & Steffen, T. (2005). Testing functional performance in people with Parkinson Disease. *Physical Therapy, 85*(2), 134-141.

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Steffen, T., & Seney, M. (2008). Test-Retest Reliability and Minimal Detectable Change on Balance and Ambulation Tests, the 36-Item Short-Form Health Survey, and the Unified Parkinson Disease Rating Scale in People With Parkinsonism. *Physical Therapy*, 88(6), 733-746. https://doi.org/10.2522/ptj.20070214

Stevenson, T. (2001). Detecting change in patients with stroke using the Berg Balance Scale. *Aust J Physiother, 47*(1), 29-38. https://doi.org/10.1016/S0004-9514(14)60296-8

Single Leg Stance	
Purpose	A motor performance assessment tool for static postural and balance control.
ICF Domain	Body Function and Activity
Equipment	Assessor: Stopwatch
Test Description	• The test is performed with eyes open and arms on the hips. • Exercise extra caution while assessing the client remotely (e.g. ensure the client can hold/grab a steady surface if required)
Population	Stroke Parkinson's Disease Multiple Sclerosis
Test Administration & Scoring	Here
Clinimetric properties (MDC/MDIC)	Not established
Normative data [Mean (SD)]	Non-specific patient population: Age group 18-99 yrs (tested with eyes open): Female: 33 (16.8) sec Male: 33.8 (17.1) sec
Cut-off Score	• Unable to perform the test for at least 5 seconds indicates increased risk of injurious fall • Parkinson's disease: 10 seconds indicates history of one or more falls with highest sensitivity (75%) and specificity (74%).
Resource	SLS

References:

Jacobs, J., Horak, F., Tran, V., & Nutt, J. (2006). Multiple balance tests improve the assessment of postural stability in subjects with Parkinson's disease. *Journal of Neurology, Neurosurgery & Psychiatry, 77*(3), 322-323. http://dx.doi.org/10.1136/jnnp.2005.068742

Springer, B., Martin, R., Cyhan, T., Roberts, H., & Gill, N. (2007). Normative values for the unipedal stance test with eyes open and closed. *Journal of geriatric physical therapy, 30*(1), 8-15.

Activities-Specific Balance Confidence Scale	
Purpose	Self-report screening tool to measure an individual's confidence in performing various activities without losing balance or experiencing a sense of unsteadiness
ICF Domain	Activity
Administration	Pen & Pencil or Telephone interview
Test Description	• It consists of 16 items that require the patient to rate his/her confidence on a scale ranging from 0 - 100 (0 = no confidence; 100= complete confidence). • The overall score is calculated by adding item scores and then diving by the total number of items. • Ensure patients are considering confidence in mobility rather than responding based on their usual level of activity to each of the items listed. • It is also available in ABC-Simplified and ABC-6 versions.
Population	Stroke Parkinson's Disease Multiple Sclerosis Brain Injury Older adults Vestibular Disorders
Test Administration & Scoring	Here
Clinimetric properties (MDC/MDIC)	Test-retest reliability: ICC PD = 0.96; Stroke = 0.85 Internal Consistency: Cronbach's alpha PD= 0.95; Stroke = 0.94 Minimal Detectable Change (MDC): Parkinson's Disease= 13
Normative data [Mean (SD)]	Older adults: 79.89% (20.59) Parkinson's Disease: 73.6% (19.3) Chronic Stroke: 68.93 % (17.5)
Cut-off Score	Active older adults: < 50 %: low level of physical functioning 50-80 %: moderate level of physical functioning 80 %: high level of physical functioning Indicative of fall risk: Parkinson's Disease: 69% Chronic Stroke (non-fallers): 81.1% Vestibular Disorders: 67%
Resource	ABC

References:

Beninato, M., Portney, L., & Sullivan, P. (2009). Using the *International Classification of Functioning, Disability and Health* as a Framework to Examine the Association Between Falls and Clinical Assessment Tools in People With Stroke. *Physical Therapy*, *89*(8). 816–825. https://doi.org/10.2522/ptj.20080160

Botner, E., Miller, W., & Eng, J. (2005). Measurement properties of the Activities-specific Balance Confidence Scale among individuals with stroke. *Disability and Rehabilitation, 27*(4), 156-163.

Huang, T., & Wang, W. (2009). Comparison of three established measures of fear of falling in community-dwelling older adults: psychometric testing. Int J Nurs Stud, 46(10), 1313-1319.

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Mak, M., & Pang, M. Fear of falling is independently associated with recurrent falls in patients with Parkinson's disease: a 1-year prospective study. *J Neurol, 256***,** 1689–1695. https://doi.org/10.1007/s00415-009-5184-5

Mak, M., Pang, M., & Mok, V. (2012). Gait Difficulty, Postural instability, and muscle weakness are associated with fear of falling in people with Parkinson's Disease. *Parkinson's Disease.* https://doi.org/10.1155/2012/901721

Salbach, N., Mayo, N., Hanley, J., Richards, C., Wood-Dauphinee, S. (2006). Psychometric evaluation of the original and Canadian French version of the activities-specific balance confidence scale among people with stroke. *Arch Phys Med Rehabil, 87*(12), 1597-604. https://doi.org/10.1016/j.apmr.2006.08.336

Steffen, T., & Seney, M. (2008). Test-Retest Reliability and Minimal Detectable Change on Balance and Ambulation Tests, the 36-Item Short-Form Health Survey, and the Unified Parkinson Disease Rating Scale in People With Parkinsonism. *Physical Therapy*, 88(6), 733-746. https://doi.org/10.2522/ptj.20070214

Upper Limb Function

Stroke Upper Limb Capacity Scale		
Purpose	A motor performance assessment tool to assess the capacity of upper limb function after stroke.	
ICF Domain	Body Function and Activity	
Equipment	Assessor	Stopwatch
	Patient	• A height-adjustable table. • A chair. • A pen. • A weekly magazine approximately A4 or Letter size (± 210 grams) folded in half lengthways. • A tea towel. • An empty peanut butter jar, ± 400 grams, with a plastic screw top lid (± 20 mm, diameter lid ± 77 mm). The closed lid and the jar are marked with a marker pen so that each time the jar is re-closed, as it would be after normal use, the marks line up (goal: to ensure that the degree of difficulty is the same each time the test is carried out). • A long drinks glass (diameter ± 55 mm, ± 150 mm high). • A tennis ball. • A comb. • A man's shirt. • Three different sized coins: a 2 NZ dollar coin (diameter ± 26.5 mm), a 50 NZ cent coin (diameter ± 23.5 mm) and a 10 NZ cent coin (diameter ± 20.5 mm) • Appendix B (see attached template)

Test Description	• The test comprises of 10 items ordered from easy to difficult, with each item having a possible score of 0 or 1
	  ○ 3 items for arm capacity without active hand capacity.
	  ○ 4 items for arm capacity and basic hand capacity.
	  ○ 3 items for complex hand capacity
	• Refer to the test template (next page) for scoring options.	

Population	Stroke	
Test Administration & Scoring	Here	
Psychometric Properties	Internal consistency: Coefficient p= 0.96; no DIF; Construct validity: Unidimensional (evidence for homogeneity); Concurrent validity: with UE-MI p= 0.88, FIMsc p= 0.76; Clinimetric properties (MDC/MDIC) & Normative data [Mean (SD)]: not established	
Resource	SULCS	

References:

Houwink, A., Roorda, L., Smits, W., Molenaar, I., & Geurts, A. (2011). Measuring upper limb capacity in patients after stroke: Reliability and validity of the Stroke Upper Limb Capacity Scale. *Arch Phys Med Rehabil, 92*(9), 1418-1422. https://doi.org/10.1016/j.apmr.2011.03.028

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Roorda LD, Houwink A, Smits W, Molenaar IW, Geurts AC. (2011). Measuring upper limb capacity in poststroke patients: development, fit of the monotone homogeneity model, unidimensionality, fit of the double monotonicity model, differential item functioning, internal consistency, and feasibility of the stroke upper limb capacity scale, SULCS. *Arch Phys Med Rehabil, 92*(2), 214-227.

Disabilities of Arm, Shoulder and Hand Questionnaire (DASH)/ QuickDASH	
Purpose	It is a patient-reported outcome measure to assess physical function and symptoms in people with disorders of the upper limb.
ICF Domain	Body Structure, Body Function, Activity, and Participation
Equipment	Pen & paper or Electronic scoring tool for a clinician or iPad application

Test Description	• The test comprises of 30 self-report items with item responses ranging from 1 (e.g. no difficulty, not at all, not limited, none, strongly disagree) to 5 (e.g. unable, extremely, unable, strongly agree)
	• It has two, 4-item optional modules to assess symptom and function in athletes, artists, and workers who require a high level of function.
	• It can be administered and completed over the phone or via alternate telehealth medium.
	• It is also available in 2 shortened versions: QuickDASH & QuickDASH-9
	• DASH and *Quick*DASH Scoring Formula = ([(sum of *n* responses)/*n*] -1)(25); where *n* represents the number of completed items.
	  ○ DASH cannot be computed if greater than three items are missing.
	  ○ *Quick*DASH cannot be computed if greater than 1 item is missing.
	• A higher scores indicate a greater level of disability and severity

Population	Musculoskeletal conditions/ Arthritis/ Joint pain and fracture Multiple Sclerosis Stroke Chronic pain
Test Administration & Scoring	Here
Clinimetric properties (MDC/MDIC)	Not established in Neurological population Musculoskeletal conditions: MCID= 10.2; MDC= 12.2
Normative data [Mean (SD)]	Osteoarthritis = 36.7 (24.03) Joint pain= 55.3 (23.2)
Psychometric Properties	Internal consistency: Cronbach's alpha = 0.98 (Multiple Sclerosis); 0.92 (Stroke)
Resource	DASH

References:

Cano, S., Barrett, L., Zajicek, J., & Hobart, J. (2011). Beyond the reach of traditional analyses: using Rasch to evaluate the DASH in people with multiple sclerosis. Multiple Sclerosis Journal, 17(2), 214–222. https://doi.org/10.1177/1352458510385269

Dalton, E., Lannin, N., Laver, K., Ross, L., Ashford, S., McCluskey, A. & Cusick, A. (2017). Validity, reliability and ease of use of the disabilities of arm, shoulder and hand questionnaire in adults following stroke, Disability and Rehabilitation, 39:24, 2504-2511.

MacDermid, J., Wessel, J., Humphrey, R., Ross, D., & Roth, J. (2007). Validity of self-report measures of pain and disability for persons who have undergone arthroplasty for osteoarthritis of the carpometacarpal joint of the hand. *Osteoarthritis and Cartilage, 15*(5), 524 – 530.

Schmitt, J., & Di Fabio, R. (2004). Reliable change and minimum important difference (MID) proportions facilitated group responsiveness comparisons using individual threshold criteria. *J Clin Epidemiol, 57*(10), 1008-1018.

ABILHAND/ ABILHAND-KIDS	
Purpose	An interview bases test to assess a patient's perceived difficulty in performing bimanual activities.
ICF Domain	Activity
Equipment	Paper questionnaire, response scale for patient or parent of the child, online access for scoring
Test Description	• The test comprises of 23 items for Chronic Stroke, 22 items for neuromuscular disorders, 26 items for Systemic Sclerosis, and 21 items for Kids. • Item responses range from 0 (Impossible) to 2 (Easy).
Population	Stroke Paediatric (Cerebral Palsy) Systemic Sclerosis Rheumatoid Arthritis
Test Administration	• The questionnaire is administered through an interview. • The patient is asked to estimate the ease or difficulty of performing each activity when the activities are done without help, irrespective of the limb(s) the patient actually uses and whatever the strategies used to perform the activity. • Note that the patient is never asked to perform the activities in front of the evaluator. • The activities are presented in a random order to avoid any systematic effect. (see the attached template for Order 1)
Psychometric Properties	Minimal Detectable Change: Subacute - Chronic Stroke MCID= 0.36 to 0.45 logits Test-retest reliability: ICC = 0.85 Internal Consistency: Person Separation Index = 0.90
Normative data [Mean (SD)]	Normative cut off of >79 on 100 indicates individual's ability to carry out bimanual tasks (Sensitivity 92% Specificity 80%)
Resource	ABILHAND; http://rssandbox.iescagilly.be/abilhand.html

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Instructions for the ABILHAND questionnaire

The ABILHAND questionnaire

The ABILHAND questionnaire was developed as a measure of manual ability as perceived by the patient. It explores the most representative inventory of manual activities. Some items were selected from existing scales; others were devised to extend the range of activities. The first application of the questionnaire in a sample of rheumatoid arthritis patients (*Arch Phys Med Rehabil 1998; 79: 1038-42*) showed that the items defined a valid manual ability scale. A second application of the questionnaire in a larger sample of chronic stroke patients showed that the unimanual activities (usually realized with one hand) were too easy for the patients. So, a subset of 23 bimanual activities (usually realized with two hands) has been retained and calibrated for chronic stroke patients (*Stroke 2001; 32: 1627-34*). ABILHAND was originally developed using the Rasch measurement model. It allows to convert ordinal scores into linear measures located on a unidimensional scale.

Procedures

The ABILHAND questionnaire is administered on an interview basis (patients do not realize the activities). Patients are asked to estimate the ease or difficulty in performing each activity, when the activities are done:

- Without other technical or human help (even if the patient actually uses help in daily life);
- Irrespective of the limb(s) actually used to do the activity;
- Whatever the strategy used (any compensation is allowed).

During the evaluation, a 3-level response scale is presented to the patients. Patients are asked to rate their perception on the response scale as either "Impossible", "Difficult" or "Easy". Activities not attempted in the last 3 months are not scored and are entered as missing responses (tick the question mark). For any activity the four potential answers are:

- ***Impossible***: the patient is unable to perform the activity without using any other help;
- ***Difficult***: the patient is able to perform the activity without any help but experiences some difficulty;
- ***Easy***: the patient is able to perform the activity without any help and experiences no difficulty;
- ***Question mark***: the patient cannot estimate the difficulty of the activity because he/she has never done the activity. Note that when a patient has never attempted the activity, the rater needs to make sure why it is so. If an activity was never attempted because it is impossible, then it must be scored as "Impossible" rather than "Question mark".

The instructions are given to the patient only at the beginning of the test. Five items are used for training in order to help the patient in feeling each level of the rating scale and in using the whole amplitude of the response scale. The subsequent activities are neither preceded nor followed by any instruction. The examiner can repeat the instructions whenever the patient shows some hesitation in answering.

Activities order

The activities of the ABILHAND questionnaire are presented in a random order to avoid any systematic effect. Ten different random orders of presentation are used. The rater must select the next one of the 10 orders for each new assessment, no matter which patient is tested.

Package content

- 1 instruction sheet;
- Testing forms in 10 random orders (10 sheets);
- Response scale presented to the patient during the evaluation (1 sheet).

ABILHAND - Manual Ability Measure
English version

Patient _____ **Date** _____

	How **DIFFICULT** are the following activities?	**Impossible**	**Difficult**	**Easy**	**?**
1.	Pulling up the zipper of trousers				
2.	Peeling onions				
3.	Sharpening a pencil				
4.	Taking the cap off a bottle				
5.	Filing one's nails				
6.	Peeling potatoes with a knife				
7.	Buttoning up trousers				
8.	Opening a screw-topped jar				
9.	Cutting one's nails				
10.	Tearing open a pack of chips				
11.	Unwrapping a chocolate bar				
12.	Hammering a nail				
13.	Spreading butter on a slice of bread				
14.	Washing one's hands				
15.	Buttoning up a shirt				
16.	Threading a needle				
17.	Cutting meat				
18.	Wrapping up gifts				
19.	Fastening the zipper of a jacket				
20.	Fastening a snap (jacket, bag, ...)				
21.	Shelling hazel nuts				
22.	Opening mail				
23.	Squeezing toothpaste on a toothbrush				

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References:

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Penta, M., Tesio, L., Arnould, C., Zancan, A., & Thonnard, J. (2001). The ABILHAND Questionnaire as a Measure of Manual Ability in Chronic Stroke Patients: Rasch-Based Validation and Relationship to Upper Limb Impairment. *Stroke, 32*, 1627–1634. https://doi.org/10.1161/01.STR.32.7.1627

Simone, A., Rota, V., Tesio, L., & Perucca, L. (2011). Generic ABILHAND questionnaire can measure manual ability across a variety of motor impairments. *Int J Rehabil Res, 34*, 131-140.

Wang, T., Lin, K., Wu, C., Chung, C., Pei, Y., & Teng, Y. (2011). Validity, responsiveness, and clinically important difference of the ABILHAND questionnaire in patients with stroke. *Arch Phys Med Rehabil, 92*, 1086-1091. https://doi.org/10.1016/j.apmr.2011.01.020

Functional Mobility

Step Test		
Purpose	A motor performance assessment tool to assess dynamic balance, lower limb motor control, and movement coordination during an activity.	
ICF Domain	Activity and Participation	
Equipment	Assessor	Stopwatch
	Patient	A 7.5 cm high step
Test Description	• The test comprises of 1 item. • It measures an individual's ability to perform steps as fast as possible in 15 seconds. • It is considered reliable when steps are calculated by viewing a videotape by a therapist. • Patients who are unable to stand unsupported were given a score of 0 for both extremities. • Consider safety issues and exercise caution when administrating the measure remotely. • User Discretion is advised: Some tests may not be appropriate depending on cognition, safety, materials, and/or another individual willing to help out at home.	
Population	Stroke	
Test Administration & Scoring	• The score is the number of steps completed in 15 seconds by each lower limb. • It needs to be performed unsupported. Exercise extra caution while assessing the patient remotely (e.g. ensure patient is supervised or can hold/grab a steady surface if required)	
Psychometric properties	Test-retest reliability: ICC= 0.88 Inter-rater reliability: ICC = 0.996 - 0.999 Intra-rater reliability: ICC = 0.981- 0.995	
Normative data [Mean (SD)]	Healthy Adults: Right= 18.7 (4.0); Left = 18.6 (4.0) Stroke: Non-paretic = 11.0 (4.2); Paretic = 8.1 (4.1)	
Cut-off Score	Comparison between Health Adults (>50 yrs) and Stroke: Paretic Side: 13 steps (Sensitivity 87%, Specificity 87%); Non-paretic Side: 11 steps (Sensitivity 100%, Specificity 67%) Stroke: <10 steps indicative of fall risk	
Resource	ST	

References:

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Timed Up & Go Test		
Purpose	A motor performance assessment tool to assess mobility, dynamic balance, walking ability, and fall risk in older adults.	
ICF Domain	Activity	
Equipment	Assessor	Stopwatch
	Patient	Standard arm chair (Approximately 46cm height)
Test Description	• Patient must use the same assistive device each time the test is done. • The patient should have one practice trial that is not included in the score. • Consider safety issues and exercise caution when administrating the measure remotely. • User Discretion is advised: Some tests may not be appropriate depending on cognition, safety, materials and/or another individual willing to help out at home.	
Population	Stroke Multiple Sclerosis Spinal Injuries Brain Injury Parkinson's Disease	
Test Administration & Scoring	Here	
Clinimetric properties (MDC/MDIC)	Chronic Stroke = 2.9 s Parkinson's Disease = 4.85s Spinal Cord Injury = 10.8s	
Normative data [Mean (SD)]	Parkinson's Disease: Non-Fallers 11.2 (5.2); Fallers 16.8 (10.1) Spinal Injuries = 17.0 (18.7) Community Dwelling Adults age 60-99 score range = 8 to 11 (1-3)	
Cut-off Score	Fall risk cut-off: Community dwelling adults > 13.5s Older stroke >14s Frail elderly >32.6s LE amputees >19s Parkinson's > 11.5s Vestibular disorders >11.1s	
Resource	TUG	

References:

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The Rivermead Mobility Index	
Purpose	Motor performance self-report assessment tool to assess functional mobility (balance, gait, transfers) following stroke.
ICF Domain	Activity
Equipment	Pen & Pencil
Test Description	• It consists of 15 items with increasing level of difficulty. • Items include 14 self-report items and 1 direct observation item. Items are scored '0=No' or '1=Yes' based on patient's ability to complete the task. • It covers a range of mobility functions from bed mobility to ability to run. • Consider safety issues and exercise caution when administrating the direct observation task remotely.
Population	Stroke Spinal Cord Injury Brain Injury Amputation
Test Administration & Scoring	Here
Psychometric properties	Stroke: Test-retest reliability: ICC = 0.96 Inter-rater reliability ICC = 0.92 Internal Consistency: Cronbach's alpha = 0.92 (Acute Stroke) Minimal Detectable Change: MDC = 2.2 points
Normative data [Mean (SD)]	Acute Stroke: Admission = 8 (4.57); Discharge = 9.75 (4.44)
Cut-off Score	Not established
Resource	RMI

References:

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Five Times Sit to Stand Test		
Purpose	A motor performance assessment tool to assess functional mobility and transfer skills.	
ICF Domain	Activity	
Equipment	Assessor	Stopwatch
	Patient	Standard height (Approximately 43-45 cm) chair with a backrest
Test Description	• It is a quick and easy to administer test of an individual's ability to safely perform sit to stand movement five times in a row. • It is an indicative assessment of lower limb strength, and movement and compensation strategies of an individual during repetitive transition between sitting and standing. • Consider safety and fatigue issues and exercise caution when administrating the test remotely. • User Discretion is advised: Some tests may not be appropriate depending on cognition, safety, materials and/or another individual willing to help out at home.	
Population	Stroke Cerebral Palsy Parkinson's Disease Multiple Sclerosis Pulmonary Disease Vestibular Disorders	
Test Administration & Scoring	Here	
Psychometric properties	Test-retest reliability: CP- ICC = 0.99; PD- ICC= 0.91; Inter-rater reliability: PD- ICC = 0.99 Minimal Detectable Change: CP- MDC = 0.06; Vestibular Dis. MCID= ≥2.3	
Normative data [Mean (SD)]	• Without balance dysfunction: 23-57yrs = 7.5-8.8 seconds 63-84yrs = 12.5-14.1 seconds • Parkinson's Disease = 9.67 (1.79) • With balance dysfunction: 14-59yrs = 13.1-17.6seconds 61-90yrs = 15.1- 17.1 seconds	
Cut-off Score	Indicative of balance dysfunction or fall risk: Stroke: 12 seconds Parkinson's Disease: >16 seconds Vestibular Disorder : 13 seconds Community Dwelling Older Adults: 60-69yrs: 11.4 seconds 70-79yrs: 12.6 seconds 80-89yrs: 14.8 seconds	
Resource	FTSTS	

References:

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Mong, Y., Teo, T., & Ng, S. (2010). 5-repetition sit-to-stand test in subjects with chronic stroke: reliability and validity. *Arch Phys Med Rehabil, 91*(3), 407-413.

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Impairment

30 Second Sit to Stand	
Purpose	A motor performance assessment tool to assess functional lower limb strength in older adults.
ICF Domain	Body structure, Body Function, Activity
Equipment	• 43.2cm folding chair without arm rests placed against the wall to prevent slipping • Stopwatch • Note: Same chair should be used for re-testing
Test Description	• The maximum number of chair stand repetitions possible in a 30 second period. • This test was developed to over the floor effects of the five times sit to stand test in older adults.
Population	Older adults Orthopaedic conditions
Test Administration & Scoring	Here
Clinimetric properties (MDC/MDIC)	Hip OA: MCII 2.0 – 2.6 stands in 30 secs
Normative data [Mean (SD)]	Normative values and cut off scores for different Osteoarthritis patient subgroups and criterion fitness standards to maintain physical independence in moderately active older adults through the resource page (see the link below).
Resource	30CST

References:

Jones, C., Rikli, R., & Beam, W. (1999). A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. *Research Quarterly for Exercise and Sport, 70*(2), 113.

Rikli, R., & Jones, C. (2013). Development and validation of criterion-referenced clinically relevant fitness standards of maintaining physical independence in later years. *The Gerontologist, 53*(2), 255-267.

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Foot Tapping Test	
Purpose	A motor performance assessment of movement coordination.
ICF Domain	Body structure, Body Function
Equipment	Patient: Standard chair
Test Description	• It is simple and easy to use measure that can be administered remotely with proper set up. • It is reported to be sensitive to detect any reduction in speed and amplitude of movement.
Population	Older adults Multiple Sclerosis Parkinson's Disease Myelopathy
Test Administration & Scoring	• The patient is seated on a chair with comfortable posture (hips and knees at ~90 degrees). • The test is measured using both feet simultaneously by having the sole of the foot tap as many times as possible for 10 seconds while keeping the heel in contact with the floor. • The examiner counts the number of taps, and each value recorded. • The subject is allowed 2 or 3 practice trials before performing 5 consecutive recorded trials. • Brief rest periods of approximately 1 minute between tests are allowed. • Record the average of these 5 trials. • Incorrectly performed reps are not counted. Examples: 1) Neurologicexam/adult/coordination_abnormal 2) Standord Medicine/Toe Tapping (3:50-5:00)
Psychometric Properties	Reliability: ICC = 0.793 (Older Adults) Concurrent validity: with Ashworth Scale r= 0.5, p<0.01 (MS); with 25FW Spearman rho = -0.795, p<0.0001 (Cervical Myelopathy)
Normative data [Mean (SD)]	Multiple Sclerosis: 21.2 Cervical Myelopathy: 23.8 (7.2) Healthy adults (20-80yrs): 31.7 (6.4)

References:

Hinman, M. (2019). Validity and reliability of a 10-second foot-tap test in older adults. *MOJ Gerontol Ger*, *4*(1), 42-46.

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Finger Tapping Test	
Purpose	Motor performance assessment of co-ordination.
ICF Domain	Body structure, Body Function
Equipment	Patient: Chair, Desk, Computer (for computerised FTT only) or iPhone with Digital Finger Tapping Test app
Test Description	• It is simple and easy to use outcome measure that can be administered remotely with a proper setup. • It can be conducted using a computer keyboard or digital app on iPhone and iPad. • Please note that normative values may vary depending on the type of device used to conduct the test. • It has been reported tapping speed is affected by hand dominance, age, and sex. • It is reported to be sensitive to detect any reduction in motor speed.
Population	Older adults Parkinson's Disease Stroke TBI Multiple Sclerosis
Test Administration & Scoring	• Patient sitting in a chair in front of a computer with a keyboard. • Patient rests a hand on the table, and places their index finger on the space bar. • Instruct the patient, "I want you to tap the bar as quickly as you can until I say stop." • Patients were given a brief opportunity to practice with either hand. • Five 10-sec. trials were administered to the dominant and then non-dominant hand. • Patients took a brief rest following each trial (10 seconds), with longer rest periods (30 seconds) following every third trial. • Patients were encouraged to adjust their posture, stretch their hands, and take deep breaths during rest breaks. • The examiner counts the number of taps, and each value recorded. • Record the average of these 5 trials. • Incorrectly performed reps are not counted.
Psychometric Properties	Interrater reliability: ICC = 0.98-0.99 (slow motion video) gross/fine motor coordination impairment; Criterion validity: Slow motion vs in person rating = 0.94; normal speed video vs in person = 0.77 Concurrent validity: MS: with 9 Peg Hole Test Spearman rho= 0.708, $p<0.0001$

Normative data [Mean (SD)]	Age	Male		Female	
		Dominant	Non-dominant	Dominant	Non-dominant
	16-24	58.2 (6.2)	51.6 (5.2)	54.7(7.6)	48.3 (5.7)
	25-39	60.4(6.2)	54.3 (5.5)	57.2 (7.5)	50.1 (4.6)
	40-54	56.8 (8.7)	49.9 (4.3)	54.4 (5.3)	48.7 (4.2)
	55-70	54.9 (6.9)	48.0 (6.3)	49.4 (6.8)	45.3 (5.4)
	total	57.3 (7.1)	50.6 (5.6)	54.6 (6.8)	48.5 (4.9)

References:

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Hubel, K., Yund, E., Herron, T., & Woods, D. (2013) Computerized measures of finger tapping: Reliability, malingering and traumatic brain injury. *Journal of Clinical and Experimental Neuropsychology, 35*(7), 745-758.

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Cognition

Montreal Cognitive Assessment	
Purpose	Rapid screening assessment of cognitive abilities to detect mild cognitive dysfunction.
ICF Domain	Body Structure, Body Function
Equipment	• Score sheet • Stopwatch • Paper • Pencil Or • iPad with MoCA app
Test Description	• It is consists of 16 items and 11 categories to assess different aspects of cognition including visuospatial and executive functions, naming, memory, attention, language, abstraction, and orientation. • The total possible score is 30. • Three different forms of the test are available to reduce the likelihood of practice effects.
Population	Parkinson's Disease Stroke Alzheimer's Disease and Progressive Dementia Neurological disorders
Test Administration & Scoring	https://www.mocatest.org/
Psychometric Properties	Internal Consistency: Cronbach's alpha =0.83 (AD); 0.78 (Stroke) Test-retest reliability: r = 0.92 (AD); ICC = 0.79 (PD)
Normative data [Mean (SD)]	AD: 16.16 (4.81) points PD= 26.2 (2.9) points Normative Sample (by Years of education): <12yrs = 20.55 (4.04)points 12yrs= 22.34 (3.97) points >12yrs = 24.81 (3.20) points
Cut-off Score	26 points or above indicative of normal cognitive function
Resource	MoCA

References:

Dalrymple-Alford, J., MacAskill M., Nakas, C., Livingston, L., Graham, C., Crucian, G., Melzer, T., Kirwan, J., Keenam, R., Wells, S., Porter, R., Watts, R., & Anderson, T. (2010). The MoCA Well-suited screen for cognitive impairment in Parkinson Disease. *Neurology, 75*(19), 1717-1725.

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Nasreddine, Z., Phillips, N., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J. & Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: A Brief Screening Tool For Mild Cognitive Impairment. *Journal of the American Geriatrics Society, 53*, 695-699.

Rossetti, H., Lacritz, L., Cullum, C., Weiner, M. (2011). Normative data for the Montreal Cognitive Assessment (MoCA) in a population-based sample. *Neurology, 77*(13) 1272-1275.

Quality of Life

Neuro-QoL- Quality of Life in Neurological Disorders	
Purpose	Patient-reported outcome measure that evaluates and monitors physical, mental, and social effects experienced by adults and children living with neurological conditions.
ICF Domain	Body Structure, Body Function, Activity, Participation
Equipment	• Paper and pencil or • Web-based tool or • iPad app (PROMIS)
Test Description	• It is available for adult and paediatric population and covers aspects of physical, cognitive, psychosocial, and participation. • It is a self-report of health-related quality of life in 17 domains and subdomains for adults and 11 for children. • The measure is available for administration via Computer Assisted Testing (CAT) or in short-form for each sub-domain that can be selected based on individual patient needs. • Number of items: Adult bank: 8-45 items; Adult short form: 5-9 items; Paediatric Bank: 1-20 items; Paediatric short form: 8-10 items • It is intended to be completed by the respondent without help. However if the respondent is unable to answer, it can be completed by a proxy (e.g., parent, caregiver). • Items are scored on a 5-point scale that ranges from least (1) to most (5) based on the frequency of behaviour, amount of difficulty, or degree of agreement. • Each domain can be completed in < 2 minutes. • Utilise the same method of administration (e.g. computer, telephone, or paper) for re-testing.
Population	Stroke Parkinson's disease Multiple Sclerosis Mixed Neurological population
Test Administration	http://www.healthmeasures.net/explore-measurement-systems/neuro-qol
Psychometric Properties	Internal Consistency: Cronbach's α= 0.81-0.94 (PD); α= 0.81-0.95 (MS) Reliability: ICC= 0.66-0.80 (PD); ICC= 0.76-0.91 (MS) Test-retest reliability: Stroke – ICC=0.73-0.94 There is limited data to support sensitivity to change
Normative data [Mean (SD)]	Normative values for different Neuro-QoL subdomains for the general population are available through the resource page (see the link below).
Resource	Neuro-QoL

References:

Cella, D., Lai, J., Nowinski, C., Victorson, D., Peterman, A., Miller, D., Bethoux, F., Heinemann, A., Rubin, S., Cavazos, J., Reder, A., Sufit, R., Simuni, T., Holmes, G., Siderowf, A., Wojna, V., Bode, R., McKinney, N., Podrabsky, T., Wortman, K., … Moy, C. (2012). Neuro-QOL: brief measures of health-related quality of life for clinical research in neurology. *Neurology*, *78*(23), 1860–1867. https://doi.org/10.1212/WNL.0b013e318258f744

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Patient Satisfaction with Treatment

Telehealth Satisfaction Survey (TeSS)	
Purpose	Patient-reported experience measure to assess patient's satisfaction with the telemedicine service and the quality of specialist care.
Survey Administratio-n	• Paper and pencil form • Online form • Telephone interview
Test Description	• The original version of the scale consists of 12-items scored on a 4-point Likert scale (1=poor, 2=fair, 3=good, and 4=excellent). • It is reported to measure two constructs: professional-patient interactions and system/technical factors. However, construct validity and measurement framework have not been established. • There is limited information regarding the psychometric properties of the scale. • The 10-item questionnaire was adapted and validated in individuals who assessed the services of the memory clinic team. • The total score on the 10-item TeSS can range from 10 to 40, with higher scores indicating higher satisfaction.
Population	Paediatric Surgery Amputation Memory clinic population
Test Administration	Refer to the template on the next page.
Psychometric Properties	Internal Consistency: Cronbach's α= 0.90 (Memory Clinic) Construct validity: established by factor analysis with evidence of the unidimensionality of the scale.

References:

Linassi, A. G., & Shan, R. L. P. (2005). User satisfaction with a telemedicine amputee clinic in Saskatchewan. *Journal of Telemedicine and Telecare, 11*(8), 414–418. https://doi.org/10.1177/1357633X0501100807

Morgan, D., Kosteniuk, J., Stewart, N., O'Connell, M., Karunanayake, C., & Beever, R. (2014). The Telehealth Satisfaction Scale: Reliability, Validity, and Satisfaction with Telehealth in a Rural Memory Clinic Population. *Telemedicine and e-Health, 20(11)*997-1003. http://doi.org.ezproxy.aut.ac.nz/10.1089/tmj.2014.0002

Telehealth Satisfaction Survey

Patient Name: _____ Date: _____

How satisfied are you with:	Poor	Fair	Good	Excellent
• The voice quality of the equipment?	☐	☐	☐	☐
• The visual quality of the equipment?	☐	☐	☐	☐
• Your personal comfort in using the telehealth system?	☐	☐	☐	☐
• The ease of getting to the telehealth department or setting up the telehealth equipment?	☐	☐	☐	☐
• The length of time with the therapist?	☐	☐	☐	☐
• The explanation of your treatment by the therapist?	☐	☐	☐	☐
• The thoroughness, carefulness, and skilfulness of the therapist?	☐	☐	☐	☐
• The courtesy, respect, sensitivity, and friendliness of the therapist?	☐	☐	☐	☐
• How well your privacy was respected?	☐	☐	☐	☐
• How well the therapist answered your questions about the equipment	☐	☐	☐	☐

Comments:

_____

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Adapted from: Morgan et al. (2014)