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# STANDARD OF CARE IN A POST-COVID-19 WORLD: ASSESSMENT AND INTERVENTION WORKSHOP FOR COGNITIVE FOG

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1. ## WHO AM I? WHY AM I HERE?

   I am a professor and speech-language pathologist who found investigating COVID during COVID to be a great way to pass the time.

2. ## LEARNING OUTCOMES:

   A. Participants will recognize the symptoms associated with brain fog in the syndrome of long COVID (post-acute sequelae of COVID-19)

   B. Participants will predict, in qualitative terms, the assessment/diagnostic tools that may best identify impairments in individuals with long COVID.

   C. Participants will know the recommendations that have been made regarding service delivery for long COVID cases.

   D. Participants will construct flexible intervention plans for individuals with long COVID.

3. ## SYMPTOMS OF LONG COVID AND BRAIN FOG

   A. Long-COVID, or "post-acute sequelae of COVID-19" (PASC) –

      i. symptoms persist or newly develop 4 weeks after a confirmed COVID-19 infection (National Institute for Health Care Excellence).

      ii. must be present 3 months after infection and must last at least 2 months (Soriano et al., 2022).

      iii. present in ~60% of COVID-19 infection survivors (though there is considerable disagreement on the rates, e.g., (Antonelli et al., 2022; Hellmuth et al., 2021).

      iv. slightly lower prevalence in those who receive at least one vaccine (Antonelli et al., 2022).

   B. Commonly reported symptoms:

    i. Fatigue, Myalgia, Dyspnea, Chest pain, Low grade fever, Cognitive problems, Headaches, Sleep problems, Anxiety, Brain fog

    ii. **Brain Fog**: "inability to concentrate and thought slowness" or "thinking/focusing difficulty" and psychopathological symptoms (particularly depressive and anxious symptoms) (Azcue et al., 2022).

    iii. Most common cognitive complaints of **brain fog** (Bungenberg et al., 2022; Krishnan et al., 2022):

        1. *Difficulty with attention and concentration*

        2. *Memory*

        3. *Word finding (18% of the sample)*

    iv. COVID-19 diagnosis also appears to increase likelihood of a neuropsychiatric diagnosis (Taquet et al., 2021).

## 4. COMPLICATING FACTORS

A. Concurrence of symptoms – e.g., COVID survivors with complaints of brain fog (specifically problems with concentration and processing speed) are also those with reporting more fatigue, mood symptoms, and poorer health status (Bungenberg et al., 2022)

B. There is considerable variance in the presence of long COVID across age groups, sex, recovery time, vaccine status, severity of infection, etc. (Shan et al., 2022).

## 5. PHASES OF THE APPROACH – PREHABILITATION, REHABILITATION, FOLLOW-UP

A. Intensive Care

B. Inpatient/Acute Care

C. Outpatient/Home Health

D. Maintenance

## 6. ASSESSMENT AND DIAGNOSTICS

A. Prehabilitation - Subjective and Objective Cognitive measures

    i. Subjective – Cognitive Failures Questionnaire (Broadbent et al., 1982)

    ii. Objective - Assessed with Montreal Cognitive Assessment (MoCA) or Mini-mental Status Examination (MMSE), Confusion Assessment Method for the Intensive Care Unit (CAM-ICU, (Chanques et al., 2018)) - https://www.icudelirium.org/medical-professionals/delirium/monitoring-delirium-in-the-icu

B. Rehabilitation

 i. Subjective – Behavioral Rating Inventory of Executive Function – Adult (BRIEF-A, (Roth et al., 2005)

 ii. Objective –

  1. *More sensitive: NIH Toolbox (Gershon et al., 2013), Computerized Revised Token Test Battery (CRTT, (McNeil et al., 2015), https://computerizedrevisedtokentest.com/), Logical Memory A and B, Verbal Fluency, Verbal and Visuospatial Learning Tests*

  2. *Comprehensive: Repeatable Battery for the Assessment of Neuropsychological Status (RBANS, (Randolph, 1998)) or the Cognitive-Linguistic Quick Test (CLQT, (Helm-Estabrooks, 2018))*

 iii. Social Communication – La Trobe Questionnaire (LCQ, (Douglas et al., 2000))

C. Follow-Up

 i. Repeat some of the above with repeatable forms for subjective and objective outcomes.

 ii. Consider developing Goal Attainment Scales in Rehabilitation that can be evaluated over time (Turner-Stokes, 2009) and https://www.kcl.ac.uk/cicelysaunders/resources.

# 7. CLINICAL PRACTICE GUIDELINES FOR COGNITIVE REHABILITATION

A. There has been one systematic review of registered intervention trials for mental health, cognition, and psychological wellbeing for long COVID (Hawke et al., 2022) – most are registered studies that have not yet completed study.

B. One study has identified 4 potential subgroups of long COVID (Gutierrez-Martinez et al., 2022):

 1. *Predominant executive function – brain fog, apathy, severe fatigue*

 2. *Amnestic – trouble with encoding and retrieval*

 3. *Worsening of pre-existing symptoms (e.g., migraine, mood disorder, sleep disorder)*

 4. *Unmasked unknown underlying disorder (e.g., seizure, HTN)*

C. Intervention approaches should center on the first 2 and can be directed, in part, by the INCOG 2.0 guidelines for cognitive rehabilitation based on evidence in traumatic brain injury (Bayley et al., 2023).
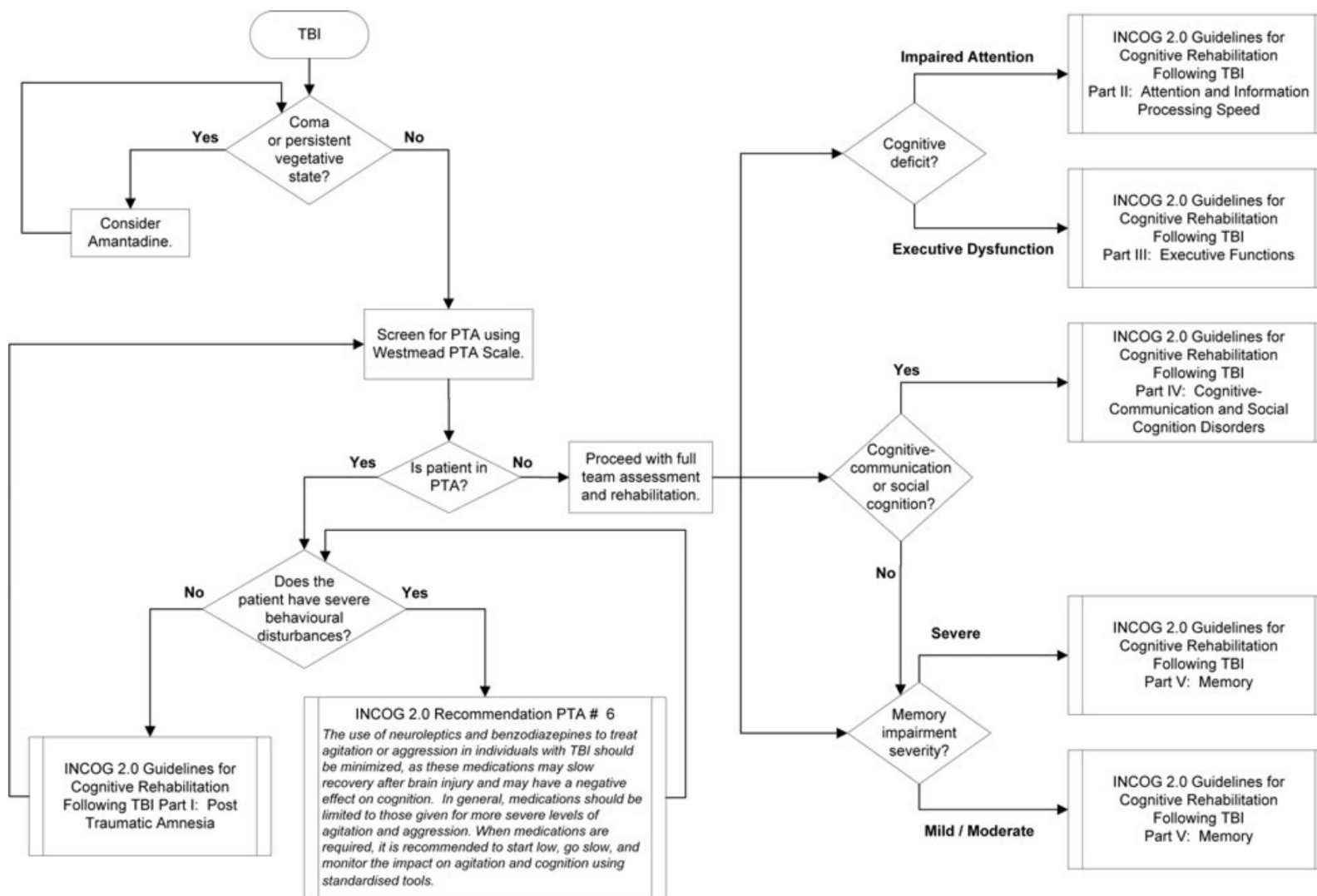
**Figure 2.** INCOG 2022 algorithm for clinician decision-making.

Works Cited

Antonelli, M., Penfold, R. S., Merino, J., Sudre, C. H., Molteni, E., Berry, S., Canas, L. S., Graham, M. S., Klaser, K., Modat, M., Murray, B., Kerfoot, E., Chen, L., Deng, J., Österdahl, M. F., Cheetham, N. J., Drew, D. A., Nguyen, L. H., Pujol, J. C., … Steves, C. J. (2022). Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: A prospective, community-based, nested, case-control study. *The Lancet. Infectious Diseases*, *22*(1), 43–55. https://doi.org/10.1016/S1473-3099(21)00460-6

Azcue, N., Gómez-Esteban, J. C., Acera, M., Tijero, B., Fernandez, T., Ayo-Mentxakatorre, N., Pérez-Concha, T., Murueta-Goyena, A., Lafuente, J. V., Prada, Á., López de Munain, A., Ruiz-Irastorza, G., Ribacoba, L., Gabilondo, I., & Del Pino, R. (2022). Brain fog of post-COVID-19 condition and Chronic Fatigue Syndrome, same medical disorder? *Journal of Translational Medicine*, *20*(1), 569. https://doi.org/10.1186/s12967-022-03764-2

Bayley, M. T., Janzen, S., Harnett, A., Bragge, P., Togher, L., Kua, A., Patsakos, E., Turkstra, L. S., Teasell, R., Kennedy, M., Marshall, S., & Ponsford, J. (2023). INCOG 2.0 Guidelines for Cognitive Rehabilitation Following Traumatic Brain Injury: What's Changed From 2014 to Now? *Journal of Head Trauma Rehabilitation*, *38*(1), 1–6. https://doi.org/10.1097/HTR.0000000000000826

Broadbent, D. E., Cooper, P. F., FitzGerald, P., & Parkes, K. R. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, *21*(1), 1–16. https://doi.org/10.1111/j.2044-8260.1982.tb01421.x

Bungenberg, J., Humkamp, K., Hohenfeld, C., Rust, M. I., Ermis, U., Dreher, M., Hartmann, N. K., Marx, G., Binkofski, F., Finke, C., Schulz, J. B., Costa, A. S., & Reetz, K. (2022). Long COVID-19: Objectifying most self-reported neurological symptoms. *Annals of Clinical and Translational Neurology*, *9*(2), 141–154. https://doi.org/10.1002/acn3.51496

Chanques, G., Ely, E. W., Garnier, O., Perrigault, F., Eloi, A., Carr, J., Rowan, C. M., Prades, A., de Jong, A., Moritz-Gasser, S., Molinari, N., & Jaber, S. (2018). The 2014 updated version of the Confusion Assessment Method for the Intensive Care Unit compared to the 5th version of the Diagnostic and Statistical Manual of Mental Disorders and other current methods used by intensivists. *Annals of Intensive Care*, *8*(1), 33. https://doi.org/10.1186/s13613-018-0377-7

Douglas, J., Bracy, C., & Snow, P. (2000). *La Trobe Communication Questionnaire*. La Trobe University School of Human Communication Sciences.

Gershon, R. C., Wagster, M. V., Hendrie, H. C., Fox, N. A., Cook, K. F., & Nowinski, C. J. (2013). NIH Toolbox for Assessment of Neurological and Behavioral Function. *Neurology*, *80*(Issue 11, Supplement 3), S2–S6. https://doi.org/10.1212/WNL.0b013e3182872e5f

Gutierrez-Martinez, L., Karten, J., Kritzer, M. D., Josephy-Hernandez, S., Kim, D., Newhouse, A., Pasinski, M., Praschan, N., Razafsha, M., Rubin, D. B., Sonni, A., Fricchione, G., Rosand, M. P. H., Jonathan, & Chemali, Z. (2022). Post-Acute Sequelae of SARS-CoV-2 Infection: A Descriptive Clinical Study. *The Journal of Neuropsychiatry and Clinical*

*Neurosciences*, *34*(4), 393–405.
https://doi.org/10.1176/appi.neuropsych.21070193

Hawke, L. D., Nguyen, A. T. P., Ski, C. F., Thompson, D. R., Ma, C., & Castle, D. (2022). Interventions for mental health, cognition, and psychological wellbeing in long COVID: A systematic review of registered trials. *Psychological Medicine*, *52*(13), 2426–2440. https://doi.org/10.1017/S0033291722002203

Hellmuth, J., Barnett, T. A., Asken, B. M., Kelly, J. D., Torres, L., Stephens, M. L., Greenhouse, B., Martin, J. N., Chow, F. C., Deeks, S. G., Greene, M., Miller, B. L., Annan, W., Henrich, T. J., & Peluso, M. J. (2021). Persistent COVID-19-associated neurocognitive symptoms in non-hospitalized patients. *Journal of NeuroVirology*, *27*(1), 191–195. https://doi.org/10.1007/s13365-021-00954-4

Helm-Estabrooks, N. (2018). Cognitive Linguistic Quick Test. In J. Kreutzer, J. DeLuca, & B. Caplan (Eds.), *Encyclopedia of Clinical Neuropsychology* (pp. 1–4). Springer International Publishing. https://doi.org/10.1007/978-3-319-56782-2_9082-2

Krishnan, K., Lin, Y., Prewitt, K.-R. M., & Potter, D. A. (2022). Multidisciplinary Approach to Brain Fog and Related Persisting Symptoms Post COVID-19. *Journal of Health Service Psychology*, *48*(1), 31–38. https://doi.org/10.1007/s42843-022-00056-7

McNeil, M. R., Pratt, S. R., Szuminsky, N., Sung, J. E., Fossett, T. R. D., Fassbinder, W., & Lim, K. Y. (2015). Reliability and Validity of the Computerized Revised Token Test: Comparison of Reading and Listening Versions in Persons With and Without Aphasia. *Journal of Speech, Language, and Hearing Research*, *58*(2), 311–324. https://doi.org/10.1044/2015_JSLHR-L-13-0030

Randolph, C. (1998). *Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Manual.* Psychological Corporation.

Roth, R. M., Isquith, P. K., & Gioia, G. A. (2005). *Behavior Rating Inventory of Executive Function-Adult Version*. Psychological Assessment Resources.

Shan, D., Li, S., Xu, R., Nie, G., Xie, Y., Han, J., Gao, X., Zheng, Y., Xu, Z., & Dai, Z. (2022). Post-COVID-19 human memory impairment: A PRISMA-based systematic review of evidence from brain imaging studies. *Frontiers in Aging Neuroscience*, *14*, 1077384. https://doi.org/10.3389/fnagi.2022.1077384

Soriano, J. B., Murthy, S., Marshall, J. C., Relan, P., Diaz, J. V., & WHO Clinical Case Definition Working Group on Post-COVID-19 Condition. (2022). A clinical case definition of post-COVID-19 condition by a Delphi consensus. *The Lancet. Infectious Diseases*, *22*(4), e102–e107. https://doi.org/10.1016/S1473-3099(21)00703-9

Taquet, M., Luciano, S., Geddes, J. R., & Harrison, P. J. (2021). Bidirectional associations between COVID-19 and psychiatric disorder: Retrospective cohort studies of 62 354 COVID-19 cases in the USA. *The Lancet Psychiatry*, *8*(2), 130–140. https://doi.org/10.1016/S2215-0366(20)30462-4

Turner-Stokes, L. (2009). Goal attainment scaling (GAS) in rehabilitation: A practical guide. *Clinical Rehabilitation*, *23*(4), 362–370. https://doi.org/10.1177/0269215508101742