

Neurocognitive Sequelae, Functional Cognition & Cognitive Communication

Provincial COVID Rehabilitation Provider Education Sessions

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Thank You

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Land Acknowledgement

We acknowledge that we are gathered virtually today on the Territories of Treaty 6, Treaty 7, and Treaty 8 and Métis Regions 1, through 6.

These territories are home to many Indigenous Peoples, including the Blackfoot, Cree, Dene, Saulteaux, Ojibwe, Stoney Nakota Sioux, and Tsuut'ina peoples, the Métis Nations of Alberta and the 8 Métis Settlements.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to moving forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.



Outline

COVID-19 and Neuropsychology
Neurocognitive Changes
Screening, Assessment, Cognitive Treatment
Case Scenarios
Functional Cognition
Cognitive Communication

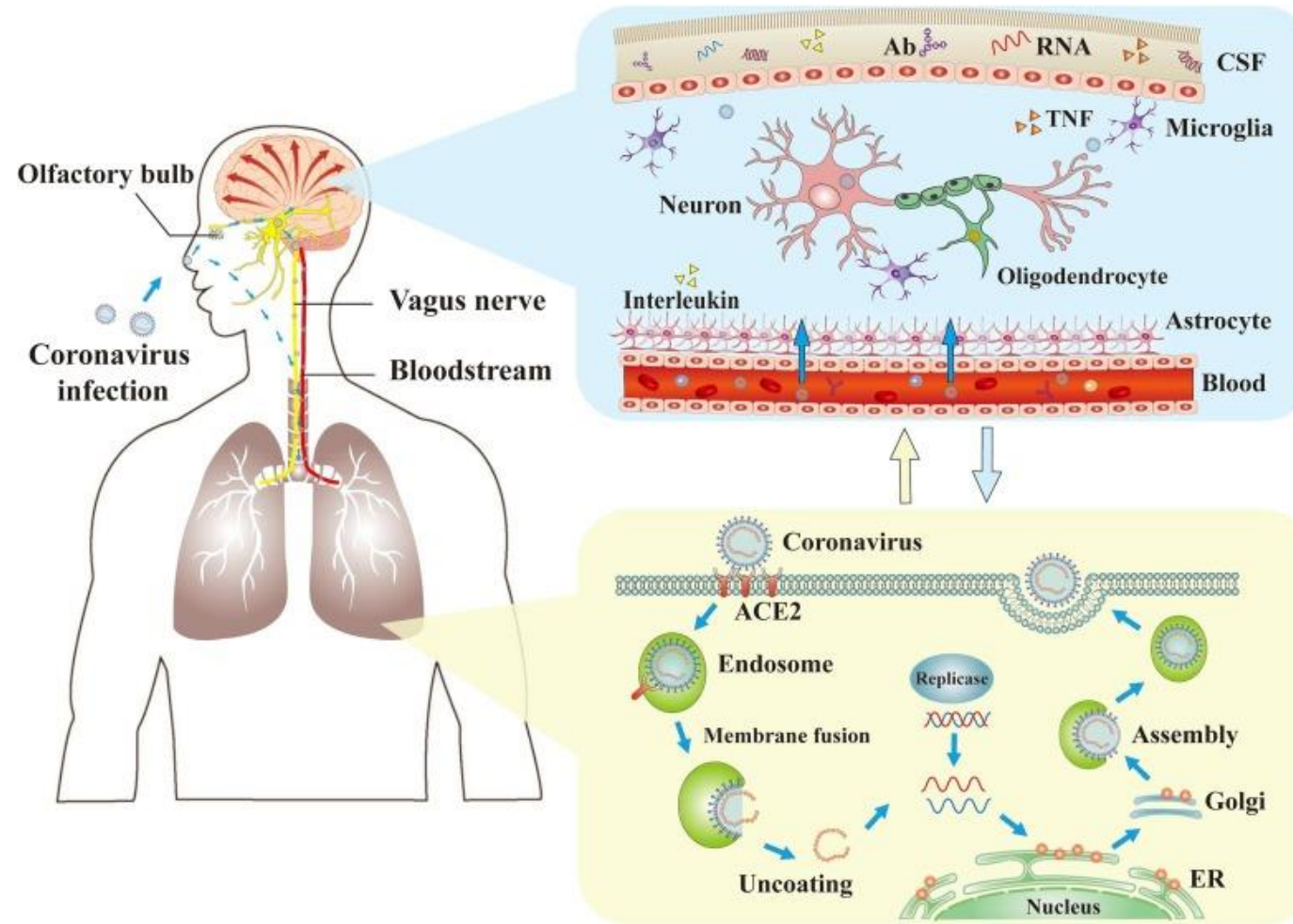
A number of different organs/organ systems can be affected by COVID-19 including the lungs, heart, and digestive systems.

There is also evidence that the central nervous system (CNS) can be affected

- directly
- indirectly

There have been reports of COVID-19 patients experiencing neurological symptoms and cognitive problems, but we don't yet know much about the cognitive pattern(s) associated with it.

Source: Dr. Barbara Wilson, *Rehabilitation from COVID-19 in adults*. Webinar March 16, 2021



Source: Wu et al. (2020). Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain Behav Immun*, 87, 18-22.

Bailey et al (2021)

- In other coronaviruses (e.g. MERS) –neuroimaging findings of extensive changes in the frontal, temporal and parietal lobes bilaterally, as well as in periventricular white matter, basal ganglia, corpus callosum, midbrain structures, cerebellum, pons and cervical cord.
- Some evidence that patients had pre-existing vascular risk factors (e.g. diabetes, hypertension, ischemic heart disease, dyslipidemia)

Other evidence covered in Bailey et al.'s (2021) review:

- Stroke, encephalitis and hypoxia may occur after COVID-19.
- Those with pre-existing neurological conditions (earlier stroke) developed COVID-19.
- Those with co-morbidities may have a more severe form of the illness.

Source: Bailey, E.K., Steward, K.A., VandenBussche, A.B. et al. (2021). Neuropsychology of COVID-19: Anticipated cognitive and mental health outcomes. *Neuropsychology*, 35(4), 335-351.

Other evidence covered in Bailey et al.'s (2021) review:

Evidence that those with severe COVID-19 infection...

- had significantly greater incidence of acute cerebrovascular disease, skeletal-muscle injury and disturbance of consciousness.
- in addition, those severe patients with neurological symptoms had greater immune and metabolic disturbances than those severe patients without neurological symptoms.
- increased cerebrovascular risk in patients with COVID-19.

Other evidence in Bailey et al. (2021) review:

Studies of COVID-19 and other coronaviruses have shown that:

- When the brain is directly affected, there may be an exacerbation of cognitive problems in those with known cognitive problems.
- Cognitive problems may also be magnified by secondary/tertiary systemic dysfunction

Cognitive outcomes are expected to be varied

- Minimal effects in milder cases
- More short and long term cognitive difficulties in those with severe/critical COVID-19
- More cognitive problems with pre-existing cognitive or medical comorbidities

Expected cognitive pattern was discussed in a recent webinar (Wilson, 2021), as well as Bailey et (2021) review:

- Expect more generalized neuropsychological impairment: attention, processing speed, learning/memory and executive dysfunction
- With seizures/vascular events, may find more focal deficits
- Expect cognitive problems will occur largely in people with known neurological illness associated with COVID-19, but may also find cognitive and emotional problems in those without obvious neurological illness

Other contributory factors to take into consideration:

- Fatigue
- Psychological issues (low mood, anxiety, PTSD, adjustment problems)

Long COVID/Long haulers

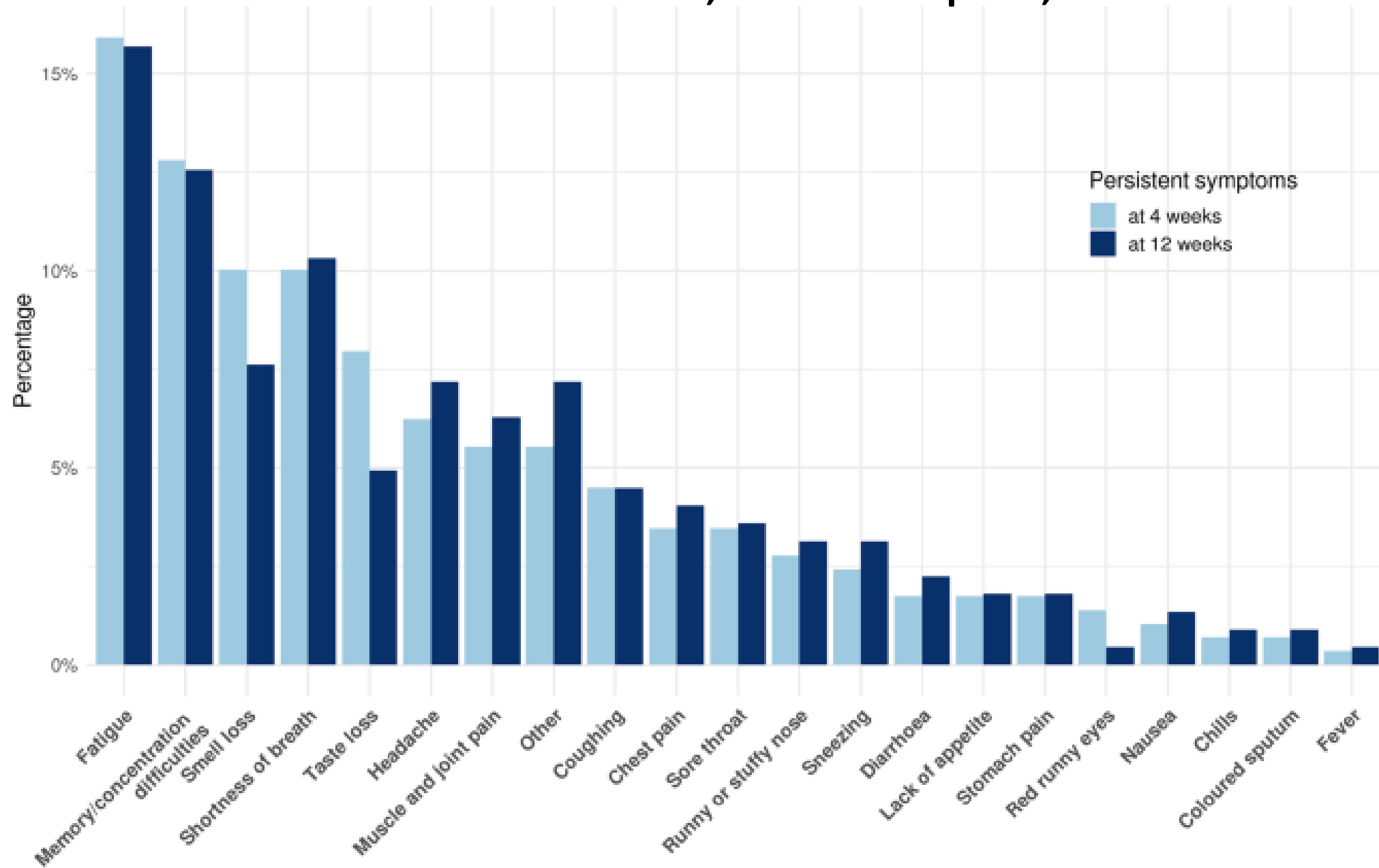
- Those who may experience persisting symptoms in the post acute phase (chronic malaise, diffuse myalgia, symptoms of low mood and non-restorative sleep), as well as headaches, loss of taste/smell, and cognitive problems
- May occur in up to 10% of COVID-19 patients
- These may be those who had serious medical complications as well as others who experience a prolonged set of symptoms that are non-specific after a relatively milder illness.
- The reasons for long COVID are not known yet, but possibilities include:
 - low level of virus still circulating in the body
 - autoimmune etiology
 - mitochondrial disease
- **Important to understand possible cognitive outcomes in the COVID-19 population. Early research suggests cognitive symptoms may occur/persist even after recovery, but the short and long term neuropsychological impacts remain largely unknown at this time**

Source: Dr. Barbara Wilson, *Rehabilitation from COVID-19 in adults*. Webinar March 16, 2021

Neurocognitive Changes

- Varying in part with illness severity
 - 50-60% in hospitalized patients (Ferrucci et al, 2021)
 - 14-21% in symptomatic outpatients (Del Bruto et al, 2021)
 - Less in asymptomatic (2-8%, based on surveys)
- May resolve with time (20% acute, 8% persisting over several months)
- Executive skills, complex attention, memory

Bliddal et al, Scientific Reports, 2021



Screening Tools

- Screening may not always identify issues (MoCA vs longer assessment)
- Consider tools based on population (ACE-III, SCIP (Johnsen et al, 2021) for younger, SLUMS, RUDAS for older)

[Cognitive Screening | Insite \(albertahealthservices.ca\)](https://albertahealthservices.ca/cognitive-screening)

[Cognitive Screening | Alberta Health Services](#)

Assessment

- Who? high risk (hospitalized, collateral reports)
- What? Memory, complex attention, executive skills
- Stage? Prior to increasing cognitive demand
- When – typical time of day (consider fatigue effects)

Cognitive Rehab Recommendations

- Pacing, activity level
- Cognitive scaffolding (schedules, lists, alarms)
- Pre-plan, talk through, and eliminate distraction
- Gradually increase cognitive complexity
- Provide homework, self-evaluation, and make relevant

Case Scenario – Inpatient – ‘Ed’

- 72 year old man with comorbid medical history, owns business, ESL
 - DM II, obesity, right bundle branch block
- Dec 3–diagnosed with COVID-19, returned home
- Dec 8 – admitted to hospital, ICU Dec 10 to Jan 31, with ARDS & delirium
- Dec 31 - CT showed, small chronic left thalamus lacunar infarct (remote?)
- Feb 8 to 19 ICU with bacteremia, UTI, critical illness myopathy, pressure ulcers
- March 6 – physiatry note – critical illness myopathy, daily cognitive gains
- March 27- admitted to neurorehab unit

Case Scenario - 'Ed'

Rehab Admission Status – Oriented to person, place, year and reason for admission. Demonstrated impaired episodic memory, working memory (2 steps), sustained and divided auditory attention. Demonstrated deficits in executive function, including self-monitoring, generalization, cognitive flexibility and insight. MoCA – 17/30

- **Physical** – 1 person max assist for bed mobility, 2 person max assist for transfers, max/mod assist for all bADLs. Patient using tilt in space wheelchair, Stage 3 coccyx injury, unable to offload independently. Impaired upper extremity function (ROM and strength) impacting bADLs and mobility.

Case Scenario – ‘Ed’

- **Neuropsychology assessment** – Severe cognitive deficits in memory, attention, processing speed, language (in English), mild visual-perceptual deficits, and little identification of deficits
- **Family did not identify deficits** – familiar topics, no check between statements and skills, some engagement with familiar aspects of business. Not reporting difficulties

Case Scenario – ‘Ed’

- **Major neurocognitive vascular disorder** (more akin to diffuse disease than stroke – was stroke a previous event?)
- Patient and family education
- Feedback on functional difficulties in the moment
- Practice, repetition and structure
- Feedback in context, cuing,
- Work with him to generate, name, and initiate concrete strategies
- Allow sufficient time
- Priming strategies before task

Case Scenario – ‘Ed’

- **Preparation for outpatient status**
- Showing improvement (mild-moderate memory impairment now)
- Using written memory book
- Record of strategies, for self and family use
- Comprehensive discharge summary
- Plan for early feedback from family on home functioning

Community Rehabilitation for Neuro Clients

- We've talked broadly about what we can expect from a neuro-cognitive perspective.
- Acute care vs. Community, Outpatient & Specialized Rehabilitation Services. Community Accessible Rehabilitation(CAR) Program.
- Different considerations for assessment/treatment.
- Impact on function.



COVID-19 and Cognitive Dysfunction

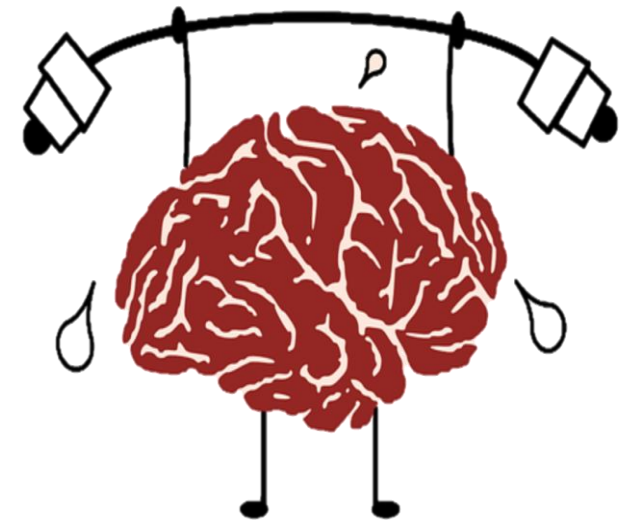
Literature regarding cognitive impact of COVID-19 is still limited, however, there have been several studies which evaluate cognitive deficits among sub-acute COVID-19 and post-COVID-19 patients.

- A study by Alemanno et al. (2021) analyzed a cohort of 87 COVID-19 patients and showed that ~80% of these patients, in the sub-acute phase of the disease, showed significant impairments of cognitive functions, including memory, attention, abstraction, and space and time orientation. This study also showed that 1 month after hospital discharge, 70% of these patients still showed signs of cognitive dysfunction.
- A study by Pistirini et al. (2021) evaluated both groups using the MoCA, 75% of COVID and 70% of post-COVID patients presented with cognitive deficits.
- In this study both groups presented with impairment of cognitive functions (executive functions, short- and long-term memory, visuospatial abilities, abstraction and orientation). Post-COVID patients after ~1 month of infection showed better performance in the language sub-domain, but did continue to present with significant memory dysfunctions.

Data highlights the gravity of the neurological and neuropsychological symptoms that can be induced by COVID-19 infection and how these symptoms can outlast the period of infection.

Functional cognition

- Cognitive changes = functional changes.
- How an individual utilizes and integrates his or her thinking and processing skills to accomplish everyday activities in clinical and community living environments.
- Temporary or permanent changes.
- Other factors impact cognition: fatigue, anxiety, deconditioning.
- Cognitive rehab within a broader context.



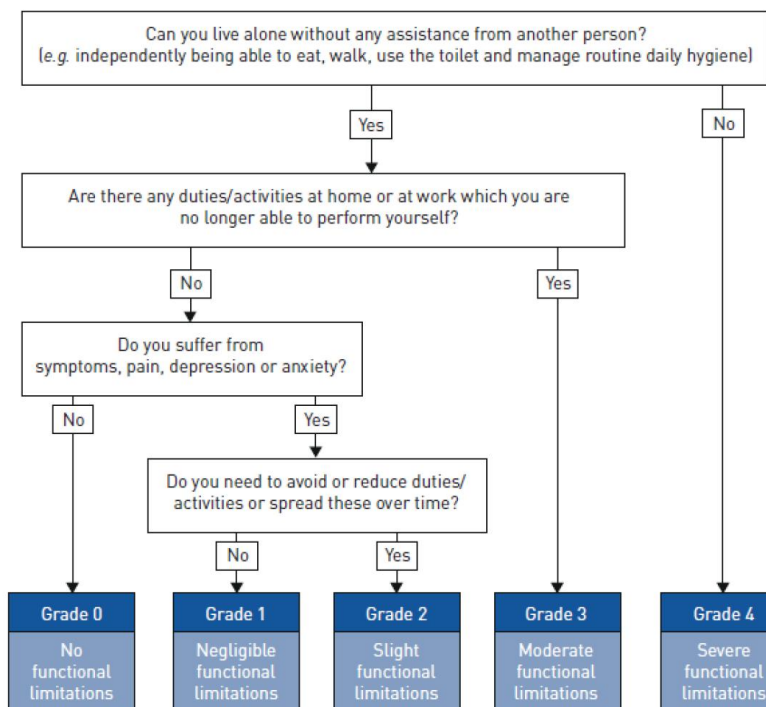
Accessing community supports

[COVID-19 Recovery & Rehabilitation After COVID-19: Resources for Health Professionals | AHS](#)

Rehabilitation screening tools: Post-Covid Functional Status Scale (PCFS)

Part 1: Post COVID Functional Status Scale (PCFS)

a)



b)

How much are you currently affected in your everyday life by COVID-19? (Please indicate which one of the following statements applies to you most)	Corresponding PCFS scale grade
I have no limitations in my everyday life and no symptoms, pain, depression or anxiety related to the infection.	0
I have negligible limitations in my everyday life as I can perform all usual duties/activities, although I still have persistent symptoms, pain, depression or anxiety.	1
I suffer from limitations in my everyday life as I occasionally need to avoid or reduce usual duties/activities or need to spread these over time due to symptoms, pain, depression or anxiety. I am, however, able to perform all activities without any assistance.	2
I suffer from limitations in my everyday life as I am not able to perform all usual duties/activities due to symptoms, pain, depression or anxiety. I am, however, able to take care of myself without any assistance.	3
I suffer from severe limitations in my everyday life: I am not able to take care of myself and therefore I am dependent on nursing care and/or assistance from another person due to symptoms, pain, depression or anxiety.	4

FIGURE 1 Patient self-report methods for the Post-COVID-19 Functional Status (PCFS) scale. a) Flowchart. b) Patient questionnaire. Instructions for use: 1) to assess recovery after the SARS-CoV-2 infection, this PCFS scale covers the entire range of functional limitations, including changes in lifestyle, sports and social activities; 2) assignment of a PCFS scale grade concerns the average situation of the past week (exception: when assessed at discharge, it concerns the situation of the day of discharge); 3) symptoms include (but are not limited to) dyspnoea, pain, fatigue, muscle weakness, memory loss, depression and anxiety; 4) in case two grades seem to be appropriate, always choose the highest grade with the most limitations; 5) measuring functional status before the infection is optional; 6) alternatively to this flowchart and patient questionnaire, an extensive structured interview is available. The full manual for patients and physicians or study personnel is available from <https://osf.io/qgpdv/> (free of charge).



CASE STUDY: EDNA

- 70 year old female, originally from Columbia, hx of hypothyroidism but otherwise healthy.
- Tested +ive for COVID-19; admitted to hospital December 18th 2020 secondary to worsening dyspnea and mild hypoxemia.
- ICU stay of 45 days with client requiring intubation and mechanical ventilation, and eventual tracheotomy.
- Acute kidney injury, bilateral pulmonary embolism, UTI, and ventilator-acquired pneumonia.
- Followed by Neurology for possible COVID-19 related hemorrhagic leukoencephalopathy.
- MRI findings: scattered areas of subarachnoid hemorrhage, prominently around the cerebellum. There was also evidence of small areas of micro-hemorrhage.
- Client remained in persistent coma until end of January 2021.

CASE STUDY: EDNA

- Turn of events -emerged from coma.
- EMG demonstrated ICU-associated polyneuropathy/myopathy.
- Transferred to a Medicine Unit in mid-February and was de-cannulated towards the end of the month.
- “Heavy client” requiring lift transfer; assistance with all BADLs.
- Low tolerance for activity, but participating in therapies.
- Physiatry consult on March 1st 2021 and wait-listed for Tertiary Neuro rehab.
- Discharge from hospital to home on March 19th 2021.
- Referred to Community Accessible Rehabilitation for ongoing rehab.

CASE STUDY: EDNA

- Phone intake with CAR OT on March 30th 2021.
- Functional status
- Common themes: weakness, deconditioning, fatigue.
- Expectations of recover and uncertainty.
- Level of function/independence.
- Perception of cognition – changes to attention, memory...
- Poor sleep; nightmares.
- Anxiety

Cognitive assessment/treatment

- Sleep hygiene
 - Energy conservation/maximization and pacing
 - Activity grading/task modification
 - Activity scheduling
 - Compensatory strategies
 - Generalizing strategies to home environment/family support
 - Adjusting expectations
-
- Cognitive screening vs. standardized assessment
 - SLUMS, BADS, Trails A and B, Dynavision, MVPT, Useful field of view
 - Focus on function

Functional Progress

- Progress can be slow and take time
- Better management of fatigue and low energy
- More in control
- Reframing and management of cognitive challenges
- Progress may not be linear
- Reassurance

Practice considerations

- Listen to your clients; get the functional picture
- Every case is different
- Involve family support
- Multi-disciplinary approach
- Knowledge sharing
- We are figuring it out...

Cognitive-Communication Disorders

Difficulties in communicative competence (listening, speaking, reading, writing, conversation, and social interaction) resulting from underlying cognitive impairments (attention, memory, organization, information processing, problem solving).

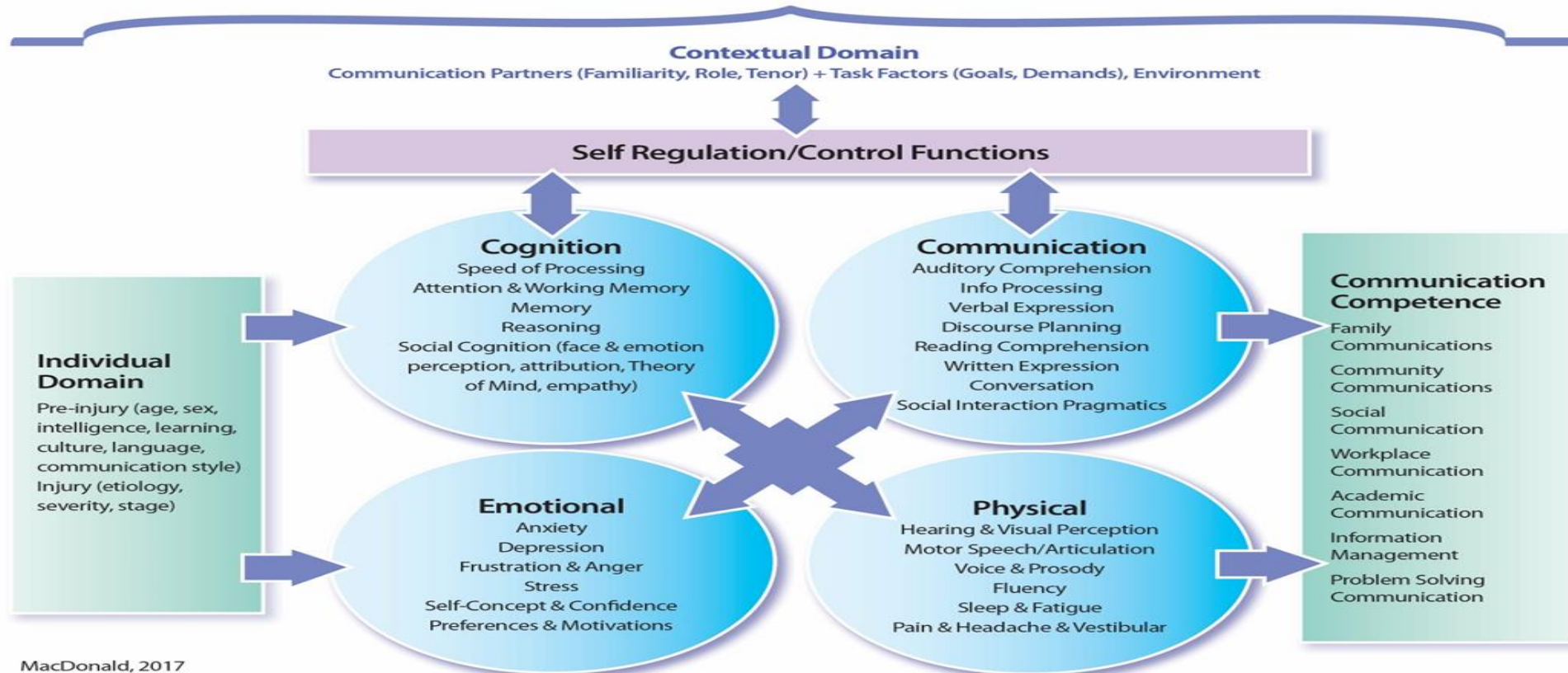
Impairments in these areas, and difficulties integrating these processes, underlie difficulties engaging in executive functions – i.e. goal-directed and purposeful behavior, communication in daily life, planning and organizing, initiation, flexible thinking and behavior, self-evaluation of performance.

Cognitive-Communication Disorders

- Comprehending spoken or written information in a timely manner
- Retaining and recalling spoken and written information
- Speaking clearly, accurately and concisely – tendency to be verbose, vague, off topic, or perseverative
- Using language to solve problems and reason
- Efficiently switching between topics/activities
- Retrieving the right word in a timely manner
- Interacting in a socially appropriate manner - e.g. dominating conversation, lack of facial expression, inappropriate remarks
- Interpreting non-literal language – idioms, metaphor, humour

Cognitive-Communication Disorders

Figure 1: A Model of Cognitive-Communication Competence



MacDonald, 2017

Case Scenario – Cornelius

- 67 year old man with unremarkable medical history
- April 2 – presented to hospital and diagnosed with post-COVID-19 pneumonia, returned home
- April 9 – admitted to hospital with oxygen saturation at 50% on room air, intubated
- April 22 - extubated but displayed declining LOC and eye deviation, re-intubated
- April 27 – extubated and transferred to a general ward on April 30 with consistent confusion and some agitation
- May 20 – admitted to Glenrose Rehab Hospital

Case Scenario – Cornelius

- **MRI Brain** - bilateral posterior cerebral artery infarcts within the left occipital pole and a smaller right occipital cortical. Bilateral hippocampi showed abnormal hyperintensive signal. Left-sided hypointensities on this exam were felt to be consistent with a diagnosis of posterior reversible encephalopathic syndrome (PRES).

Case Scenario – Cornelius

- **Rehab Admission Status**

- Disoriented to year, poor route finding
- No memory of the COVID-19 pandemic
- Some awareness of his memory deficits
- Difficulty following command
- Restless and impulsive behavior
- Right visual field loss

Case Scenario – Cornelius

- **SLP Assessment** - Western Aphasia Battery (WAB)-Revised and Butt Test of Non-Verbal Reasoning (BTNVR) completed in English and then a second time with a virtual Mandarin interpreter.
- **Cognitive-Communication** - frequently required task repetition and redirection, difficulty switching from one task to another, tangential and impulsive comments and responses, action picture description was disorganized and repetitive, difficulties understanding word meanings.

Case Scenario – Cornelius

- **Auditory Comprehension** - responses to simple yes/no questions in Mandarin were less than 75% accurate. Able to follow simple one or two step spoken commands, but had challenges with more complex and longer commands.
- **Verbal Expression** – impaired word retrieval and repetition of words and sentences

Case Scenario – Cornelius

- **Treatment** - focus on understanding and responding accurately to yes/no questions, reading comprehension at single word level, problem solving in every day situations.
- **Communication Strategies**
 - Use Mandarin interpreter to provide patient with important medical or other information
 - Help patient to understand by speaking in slow, simple sentences and writing down key words.
 - Provide patient with a quiet space to complete more complex tasks

Practice Considerations Resource

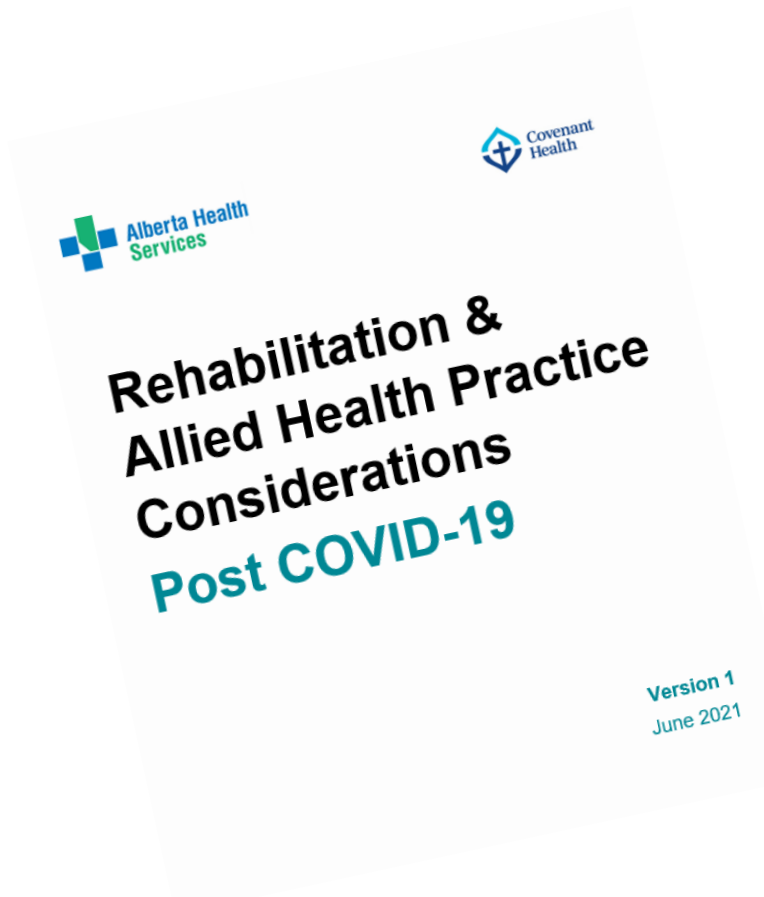










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For more information

Post COVID Provider Resource Webpage (AHS external)

[COVID-19 Recovery & Rehabilitation After COVID-19: Resources for Health Professionals](#)

Allied Health Practice and Education Hub (for staff)

[Post-COVID Clinician Resources - All Documents \(ahsnet.ca\)](#)

Email Practice.consultation@ahs.ca

Rehabilitation Advice Line

Rehabilitation advice can help you recover from injury, orthopedic surgery, COVID-19 or manage a neurological condition.

A healthcare professional on the line can provide you with:

- Activities and exercises to help with physical concerns
- Strategies to manage day-to-day activities affected by these concerns
- Rehabilitation services open for in-person or virtual visits
- Community organizations available for support

1-833-379-0563

9 a.m. to 5 p.m. Mon-Fri

Mental Health Help Line

24 hour, 7 day a week confidential service that provides support, information, and referrals to Albertans experiencing mental health concerns

The line is staffed by a multidisciplinary team comprised of nurses, psychiatric nurses, social workers, occupational therapists, and psychologists.

- Confidential, anonymous service
- Information about mental health programs and services

1-877-303-2642

Additional Webinars

Recordings will be available:

- **June 10** – Physical Sequelae and Screening
- **June 15** – Maximizing Energy and Returning to Daily Activities and Meaningful Occupations
- **June 22** – Resuming Activity & Exercise
- **June 29** – Psychological, Spiritual and Social Considerations Important in Post-COVID Care
- **July 6** – Neurocognitive Sequelae, Functional Cognition and Cognitive Communication

Upcoming:

- **July 13** – Nutrition, Eating, Feeding and Swallowing
- **July 20** – Re-engagement in the Community

Questions?

References

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