

COVID-19 Evidence Support Team RAPID REVIEW REPORT

What are long COVID's demands on the healthcare system, and its severity of the illness?

Review Code: EPM210602 RR **Review Date:** July 12, 2021
Version: 1 **Review History:**

Cite As: McLean, M; Williams-Roberts, H; Reeder, B; Howell-Spooner, B; Ellsworth, C. What are long COVID's demands on the healthcare system, and its severity of the illness? 2021 Jul 12, Document no.: EPM210602 RR. In: COVID-19 Rapid Evidence Reviews [Internet]. SK: SK COVID Evidence Support Team, c2021. 23 p. (CEST rapid review report).

Full author statement available at the end of report.

Key Findings

- Long COVID-19 is likely to increase healthcare demands across the health system, including emergency departments, hospital admissions, primary care visits, specialists appointments, and home care and rehabilitation services.
- The clinical care burden of long COVID-19 is the greatest in the first 3 months after testing and is likely to place the greatest demand on primary care services.
- Patients with severe COVID-19 illness are more likely to place longer-term demands (4-6 months) on specialist care due to respiratory, circulatory, endocrine, metabolic, psychiatric and unspecified conditions.

Limitations

- No studies focused on the healthcare demands required for patients with long COVID-19 with unspecified conditions.
- Few studies compared health service utilization pre and post COVID-19 infection.
- No studies examined healthcare demands of long COVID-19 beyond 6 months after testing.
- Few studies examined non-hospitalized or mixed patient cohorts which limits the generalizability of the findings to patients who had severe COVID-19 disease.

Strength of Evidence

Mature evidence

Emerging Supportive evidence

Mixed evidence

Weak evidence

Quality of Evidence Assessment

- 1. Adequacy of primary studies:** Of the 15 articles that were included in this review, 7 were not peer reviewed by a credible source. Of these 7 articles, 5 were clinical guidelines, 1 was a rapid review and 1 was a cohort study. Of the remaining peer reviewed articles, 7 were cohort studies and 1 was a cross-sectional study.
- 2. Methodological limitations:** The duration and timing of patient follow-ups varied across studies, with no studies examining the healthcare demands of long COVID-19 beyond 6 months. Importantly, most studies did not compare the service utilization pre and post COVID-19 infection. This makes it difficult to determine whether healthcare demands related to long COVID-19 are due to COVID-19 complications or other pre-existing health conditions. Finally, few studies examined healthcare demands among non-hospitalized or mixed patient cohorts.
- 3. Relevance to review question:** Articles were selected based on their relevance to the review questions, and those cited were relevant to the questions
- 4. Generalizability of findings:** Studies were conducted in developed countries such as the United States, United Kingdom, Norway, Denmark, Scotland, Australia, Only a rapid review conducted in Ontario was included in this review. Given that Canada may have different population demographics and healthcare system organization, the generalizability of these findings to the Canadian context may be limited.

Background/Context

1. Clinical Context

Currently, there is limited research on the long-term implications of COVID-19 for patients and healthcare system resources. Studies report that some patients with COVID-19 continue to report a broad range of pulmonary and extrapulmonary clinical manifestations (including nervous system and neurocognitive disorders, mental health disorders, metabolic disorders, cardiovascular disorders and gastrointestinal disorders) as well as symptoms related to poor general health (including malaise, fatigue, musculoskeletal pain and anemia) even after their infection has subsided. Therefore, there is a need for healthcare systems to plan for the increase in demands for healthcare services among patients with long COVID-19, including emergency department visits, hospital admissions, primary care visits, specialist appointments, as well as home care and rehabilitation services.

2. Purpose

This review seeks to assess the clinical care burden of long COVID-19 and the implications for the healthcare system of Saskatchewan.

3. Review Question(s)

- What is the clinical care burden of long COVID-19 (defined as >4 weeks of persistent symptoms)?
- What are the implications of long COVID-19 (defined as > 4 weeks of persistent symptoms) for the healthcare system of Saskatchewan?

Method

For each Rapid Review, the initial question is posed by a decision-maker in the health care system seeking the evidence base for a specific policy decision. According to the subject of the question, the COVID Evidence Support Team (CEST) Intake Committee allocates the question to the appropriate Working Group. Each Working Group may be comprised of a librarian, researcher, 1-2 clinicians, 1-2 subject matter experts, and a group leader. A reference interview is conducted to establish the parameters of the question to ensure it is articulated in a clear, searchable manner. The librarians assigned to the team then conduct a thorough search of the indexed literature, grey literature, news sources, or other sources as agreed upon. Some reference lists for especially pertinent articles are also reviewed. An Evidence Search Report is thereby created. See Appendix for more details on the search strategy. A Rapid Review of the identified literature is then performed by the researcher using the approach of a systematic review, but without a double review, formal assessment of quality of reported study, or meta-analysis. Importantly, the review is completed in a time-sensitive manner. Relevant evidence is summarized in both tabular and narrative form, key findings and limitations articulated, and the quality of the body of evidence evaluated using a four-point grading system that assesses the methodologies, adequacy of the included studies, the direct relevance to the question and the generalizability of the findings related to the question. The draft Rapid Review Report is reviewed and edited by the Working Group clinicians, experts, and leader. Once revisions are complete, the Rapid Review is submitted to the requesting decision-maker and placed in the COVID-19 repository and database. For certain topics with rapidly changing evidence, after a period of time an updated evidence search is performed, the review process repeated, and an updated Rapid Review released.

Summary of Evidence

Clinical Guideline Recommendations

While there are no specific treatments available for long-COVID, clinical guidelines for the management of long COVID-19 patients have been proposed.¹⁻⁵ First, investigations should be conducted to rule out acute or life-threatening complications and to find out if symptoms are due to an ongoing symptomatic COVID-19 infection, post COVID-19 syndrome or other unrelated diagnosis.¹ In order to avoid unnecessary testing, investigations should be tailored to each patient's symptom profile rather than ordered as a standard panel.² Potential tests may include a full blood count, kidney, liver function tests, C-reactive protein test, ferritin, B-type natriuretic peptide (BNP), thyroid function test and exercise tolerance test.³ Additionally, clinical guidelines recommend offering patients a chest x-ray at 12 weeks if there is persistent respiratory symptoms.⁴ After ruling out serious complications, long COVID symptoms (i.e. headache) or conditions (e.g. dysautonomia) should be managed by primary care providers or multidisciplinary teams through shared decision-making with patients.^{1,5} Multidisciplinary teams are recommended to include a range of specialists including occupational therapists, speech and language therapists, nutritionists, physiotherapists, clinical psychologists, and rehabilitation medicine therapists.^{4,5} Clinical care should focus on optimizing the management of underlying comorbidities and

providing information on symptoms management, support services, vitamins and supplements, and supporting patients in discussions with their employer, school or college about returning to work or education.⁵ Importantly, follow-up visits with healthcare providers should take place every 2-3 months depending on the patient's condition and illness severity.¹

Emergency/Hospital Care

In the current review, several studies reported on the clinical care burden of long COVID-19 for emergency departments and hospitals. One American, prospective, single center cohort study found that out of 18 COVID-19 patients, 4 (22.2%) visited the emergency department and were readmitted to hospital in the first 30 days following discharge.⁶ Importantly, both functional status and comorbidity status predicted 30-day hospital readmission following inpatient rehabilitation.⁶ However, no patients were readmitted between 30-90 days following hospital discharge.⁶ Another Danish cohort study of 10,293 COVID-19 patients and 80,894 reference patients found that there was an increase in outpatient hospital visits (adjusted rate ratios 1.10 [1.05-1.16]), but not hospital admissions among COVID-19 patients when compared to reference patients.⁷ A retrospective cohort study of 1345 New Yorkers found that of those patients who received follow-up at 3 months, 9.3% (n = 125) had visited the emergency department and 7.1% (n = 96) had been readmitted to hospital.⁸ Of the 1198 New Yorkers who received follow-up at 6 months, 10% (n = 121) had visited the emergency department and 6.3% (n = 76) had been readmitted to hospital.⁸

Outpatient Care

Several studies suggested that most COVID-19 patients access outpatient services in the months following hospital discharge. One American single center cohort study of 18 COVID-19 patients found that all patients required outpatient visits within 0-90 days following hospital discharge with the median number of outpatient visits being 4 (IQR = 2-6).⁶ Another cohort study of 73,435 COVID-19 patients and 4,990,835 patients without COVID-19 found that patients with COVID-19 had a higher risk of requiring outpatient care (hazard ratio of 1.20 (1.19–1.21), at an excess burden of 33.22 (30.89–35.58) visits per 1,000 patients at 6 months and at a greater frequency of 0.47 (0.44–0.49) additional visits every 30 days.⁹ Similarly, a Norwegian cohort study of 16,788 and 1,309 patients with mild and severe COVID-19, respectively, found that the rate of healthcare utilization was higher among both cohorts of patients at 0-3 months (15.3% and 31.32%, respectively) but returned close to pre COVID-19 levels after 4-6 months (7.86% and 17.28%, respectively).¹⁰ These findings suggest that COVID-19 patients predominantly burden healthcare systems 0-3 months after testing, with limited persistent increase in health care utilization beyond 3 months.¹⁰

Primary Care

Several studies reported that the long COVID-19 placed the greatest demand on primary care services. One Danish cohort study of 10,293 COVID-19 patients and 80,894 reference patients found that there was an increase in primary care physician visits (1.18 [95% CI 1.15-1.22]) among COVID-19 patients compared to reference patients.⁷ Another Norwegian cohort study of 16,788 patients with mild COVID-19 and 1,309 patients with severe COVID-19 found that both mild and severe COVID-19 had a minor impact on primary care visits due to general and unspecified conditions (4-7% increase at 0-3 months, no increase for 4-6 months). Additionally, both mild and severe COVID-19 had a large impact on primary care visits at 0-3 months due to respiratory conditions (786% and 1287% increase at 0-3 months, respectively, and no increase at 4-6 months) (relative change -37%, -59%, respectively). Finally, there was a large increase in primary care visits due to mental health concerns for both patients with mild or severe COVID-19 and among those without COVID-19.¹⁰ An American single center cohort study of 18 COVID-19 patients found that 14 (82.4%) followed up with their primary care provider following hospital

discharge with the medium number of visits being 2 (IQR = 1 – 3).⁶ Similarly, a retrospective cohort study of hospitalized COVID-19 patients in New York found that among 1345 patients who received 3 month follow-up, 35.1% (n = 472) had visited their primary care provider, and of 1198 patients who received 6-month follow-up 18.7% (n = 224) had visited their primary care provider after 6 months.⁸

Specialist Care

A small number of studies mentioned the continued need for specialist care among COVID-19 patients. One retrospective cohort study of New Yorkers found that among patients who received follow-up at 3 months (n = 1345) and at 6 months (n = 1198), 43.6% (n = 587) and 56.8% (n = 681) had received specialist care, respectively.⁸ Another American prospective, singly center cohort study found that out of 17 recovering COVID-19 patients, 8 (47.2%) received cardiology care (median visits = 0, IQR: 0-2), 7 (41.2%) received pulmonary care (median visits = 0, IQR: 0-2) and none received neurological care.⁶ Similarly, a Norwegian cohort study of 1,309 patients with severe COVID-19 found that severe COVID-19 had a large impact on outpatient specialist care at 0-3 months (48% increase) and on outpatient specialist care at 4-6 months (40% increase).¹⁰ More specifically, severe COVID-19 impacted on visits due to respiratory (337-3316% increase), circulatory (166-205% increase), endocrine/metabolic/nutritional (168-791% increase) as well as visits due to general/unspecified conditions (48-431% increase) in outpatient and inpatient specialist care 0-3 months after testing.¹⁰ Severe COVID-19 also impacted outpatient specialist care after 4-6 months, for respiratory and circulatory conditions (199% and 246% increase, respectively) and general/unspecified conditions (40% increase).¹⁰ These findings suggest that mild COVID-19 does not lead to increase demand for specialist care beyond the first two months of infection and the increase in demand specialist care for those who have undergone severe COVID-19 is due to respiratory, circulatory, endocrine, metabolic, and general/unspecified causes.

Conclusions

Findings of the current rapid review suggest that the clinical burden of long COVID-19 will be unevenly distributed across the healthcare system. These studies suggest that the burden of care of long COVID-19 is the greatest in the first 2-3 months after testing and will place the greatest demand on primary care services due to respiratory concerns, poor mental health and general or unspecified conditions. Similarly, these studies show that patients with mild COVID-19 will require additional inpatient and outpatient specialist services in the first 2-3 months following testing. However, patients with severe COVID-19 require the greatest specialist services in 0-3 months after testing and continue to require specialist care at 4-6 months after testing. Therefore, a small proportion of the patients who experienced severe COVID-19 and report existing comorbidities are the most likely to require ongoing specialist care.

Glossary

COVID-19: coronavirus disease of 2019

Long COVID-19: defined as < 4 weeks of persistent symptoms

Table 1: Summary of Evidence

Consult the Summary of Evidence table using the following link:

<https://covid19evidencereviews.saskhealthauthority.ca/en/permalink/coviddoc345>

This link provides access to the database where it is possible to view the spreadsheet for review.

Reference List

1. Evaluating and Caring for Patients with Post-COVID Conditions: Interim Guidance [14 June 2021] <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-index.html>
2. Oregon Health & Science University. Clinical Guidelines: Long COVID-19. (21 Apr 2021) <https://www.ohsu.edu/sites/default/files/2021-04/Long-COVID-19-Clinical-Guidelines-English-April-21-2021.pdf>
3. NICE Guideline. COVID-19 rapid guideline: managing the long-term effects of COVID-19. [18 Dec 2020] <https://www.ncbi.nlm.nih.gov/books/NBK567261/>
4. Royal Australian College of General Practitioners. Caring for adult patients with post-COVID-19 conditions. [2020] <https://www.racgp.org.au/FSDEDEV/media/documents/RACGP/Coronavirus/Post-COVID-19-conditions.pdf>
5. Scottish Intercollegiate Guidelines Network (SIGN). SIGN 161: Managing the long-term effects of COVID-19. [18 Dec 2020] <https://www.sign.ac.uk/media/1833/sign161-long-term-effects-of-covid19-11.pdf>
6. Jain E, Harmon EY, Sonagere MB. Functional outcomes and post-discharge care sought by patients with COVID-19 compared to matched controls after completing inpatient acute rehabilitation. *PM R*. 2021;13(6):618-25.
7. Lund LC, Hallas J, Nielsen H, et al. Post-acute effects of SARS-CoV-2 infection in individuals not requiring hospital admission: a Danish population-based cohort study. *The Lancet Infectious Diseases*. 2021;10:10
8. Shoucri S, Adan MA, Purpura L, et al. Long-term sequela of SARS-CoV-2 infection in a retrospective New York City Cohort. *Top Antivir Med*. 2021;29 (1):210.
9. Al-Aly Z, Xie Y, Bowe B. High-dimensional characterization of post-acute sequelae of COVID-19. *Nature*. 2021;594(7862):259-64.
10. Skyrud K, Hernæs KS, Telle K, Magnusson K. Impacts of COVID-19 on long-term health and health care use. *medRxiv* 2021.02.16.21251807; doi: <https://doi.org/10.1101/2021.02.16.21251807>

Appendix 1: Evidence Search Details

Note: To view full search strategy details, please consult the associated Evidence Search Report.

Filters, Limits & Exclusions:	English only January 1, 2020 – June 24, 2021 ...
Sources Searched:	<ul style="list-style-type: none"> • Alberta Health Services • CADTH • Canadian Thoracic Society • CDC • CEBM • Center for Effective Practice • Cochrane • CINAHL • CPG Infobase • ECRI • Embase • Google • Google Scholar • Health Canada • L-OVE • McMaster Evidence Alerts • MEDLINE • medRxiv • National Collaborating Centre for Methods and Tools • National COVID-19 Clinical Evidence Taskforce (Aust) • PubMed • SIGN (UK) • PsychArXiv • TRIP • Veteran Affairs database • WHO Global Research database
Librarian(s):	Michelle Dalidowicz, Clinical Librarian, Saskatchewan Health Authority Mark Mueller, Clinical Librarian, Saskatchewan Health Authority

Appendix 2: Search Strategies

MEDLINE

Ovid MEDLINE(R) ALL <1946 to June 22, 2021>

#	Searches	Results
1	COVID-19/ or SARS-CoV-2/	87441
2	(coronavirus/ or betacoronavirus/ or coronavirus infections/) and (disease outbreaks/ or epidemics/ or pandemics/)	40053
3	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARSCOV2 or Severe Acute Respiratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syndrome Corona Virus 2 or coronavirus*).ti,ab,kf,nm,ox,rx,px.	157203
4	((new or novel or "19" or "2019" or Wuhan or Hubei or China or	44958

	Chinese) adj3 (coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV)).ti,ab,kf.	
5	((coronavirus* or corona virus* or betacoronavirus*) adj3 (pandemic* or epidemic* or outbreak* or crisis)).ti,ab,kf.	8380
6	((Wuhan or Hubei) adj5 pneumonia).ti,ab,kf.	342
7	1 or 2 or 3 or 4 or 5 or 6	160652
8	((sequela? or long* or longterm or long-term or "medium* term*" or mediumterm or longtail or long-tail or longhaul* or long-haul* or long-last* or long-stand* or chronic* or "post acute" or post-acute or subacute or subacute or recurr* or "non recover*" or nonrecover* or "not recover*") adj1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or SARScoronovirus2* or "SARS-coronavirus-2*" or "SARScoronovirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*")).ti,ab.	340

9	<p>((post* or chronic* or continual or continuing or continuous or delay* or after or endur* or extend* or fluctuat* or following or gradual* or lasting or legacy or lengthy or linger* or long* or mediumterm or medium term or multisystem* or "multi system*" or post-hospital* or "post hospital*" or "after hospital*" or "follow* hospital*" or post-discharg* or "post discharg*" or "after discharg*" or "follow* discharg*" or post-infect* or "post infect*" or "after infect*" or "following infect*" or post-viral or "post viral" or "after viral" or "following viral" or post-virus or "post virus" or recurr* or relaps* or extend* or permanent or persist* or prolong* or protract* or ongoing or recurring or remit* or residual or recurrant* or subacute or "sub acute")adj1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARScoronavirus-2*" or "SARScoronavirus 2*" or "SARScoronavirus2*" or SARScoronavirus2* or "SARScoronavirus-2*" or</p>	1018
---	--	------

	"SARScoronavirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*") adj3 (symptom* or syndrome* or complication? or condition? or comorbid* or co-morbid* or multimorbid* or multi-morbid* or disease* or disorder* or disabilit* or illness* or recuperat* or sickness* or sign or signs or suffering? or survival)).ti,ab.	
10	8 or 9	1250
11	7 and 10	1225
12	(COVID-19/ or SARS-CoV-2/) and (exp Chronic Disease/ or recurrence/ or symptom flare up/)	620
13	(COVID-19/ or SARS-CoV-2/) and ((chronic* or continuous* or continual* or continuing* or delay* or endure* or extend* or fluctuat* or gradual* or lasting* or legacy* or lengthy* or linger* or long* or "medium* term*" or mediumterm* or multisystem* or "multi system*" or ongoing or permanent* or persist* or prolong* or protract* or relaps* or remission* or remit* or residual* or slow* or subacute* or "sub acute*") adj3 (complication? or consequence? or convalescen* or disabilit* or feature* or illness* or prognos* or sequela* or sign or signs or suffering? or symptom* or recuperat*)).ti.	109
14	11 or 12 or 13	1899
15	Patient Care/ or exp Patient Care Management/ or Aftercare/ or exp Rehabilitation/ or Ambulatory Care/	1153630
16	((clinical or patient or outpatient) adj1 (care? or "after care" or aftercare or follow-up or manag* or therap* or treat* or rehab or	259064

	rehabilit* or habilit* or service?)).ti,ab.	
17	15 or 16	1363002
18	14 and 17	328
19	limit 18 to (english language and yr="2019-Current")	319
20	remove duplicates from 19	315

Embase

Embase <1974 to 2021 June 22>

#	Searches	Results
1	coronavirus disease 2019/ or exp severe acute respiratory syndrome coronavirus 2/	128690
2	(coronavirinae/ or betacoronavirus/ or coronavirus infection/) and (epidemic/ or pandemic/)	10805
3	(nCoV* or n-CoV or "n-covid" or 2019nCoV or "2019-ncov" or 19nCoV or COVID19* or "COVID-19*" or COVID or SARS-COV-2 or SARSCOV-2 or SARSCOV2 or "Severe Acute Respiratory Syndrome Coronavirus 2" or "Severe Acute Respiratory Syndrome Corona Virus 2" or SARS2 or "SARS-2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus 2" or "SARS coronavirus2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus 2" or "SARS coronavirus2" or "HCoV-19" or HCoV19).ti,ab,kw,hw,ot.	144062
4	((new or novel or "19" or "2019" or Wuhan or Hubei or Huanan or China or Chinese) adj3 (coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV)).ti,ab,kw,hw,ot.	132366
5	((coronavirus* or corona virus* or betacoronavirus*) adj3 (pandemic* or epidemic* or outbreak* or crisis)).ti,ab,kw,ot.	8119

6	((Wuhan or Hubei) adj5 pneumonia).ti,ab,kw,ot.	380
7	1 or 2 or 3 or 4 or 5 or 6	156819
8	((sequela? or long* or longterm or long-term or "medium* term*" or mediumterm or longtail or long-tail or longhaul* or long-haul* or long-last* or long-stand* or chronic* or "post acute" or post-acute or subacute or sub-acute or recurr* or "non recover*" or nonrecover* or "not recover*") adj1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*")).ti,ab.	346
9	((post* or chronic* or continual or continuing or continuous or delay* or after or endur* or extend* or fluctuat* or following or gradual* or lasting or legacy or lengthy or linger* or long* or mediumterm or medium term or multisystem*	1021

	<p>or "multi system*" or post-hospital* or "post hospital*" or "after hospital*" or "follow* hospital*" or post-discharg* or "post discharg*" or "after discharg*" or "follow* discharg*" or post-infect* or "post infect*" or "after infect*" or "following infect*" or post-viral or "post viral" or "after viral" or "following viral" or post-virus or "post virus" or recurr* or relaps* or extend* or permanent or persist* or prolong* or protract* or ongoing or recurring or remit* or residual or recurran* or subacute or "sub acute") adj1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*") adj3 (symptom* or syndrome* or complication? or condition? or comorbid* or co-morbid* or</p>	
--	--	--

	multimorbid* or multi-morbid* or disease* or disorder* or disabilit* or illness* or recuperat* or sickness* or sign or signs or suffering? or survival)).ti,ab.	
10	8 or 9	1253
11	7 and 10	1206
12	(coronavirus disease 2019/ or exp severe acute respiratory syndrome coronavirus 2/) and (exp chronic disease/ or recurrent disease/)	1423
13	(coronavirus disease 2019/ or exp severe acute respiratory syndrome coronavirus 2/) and ((chronic* or continuous* or continual* or continuing* or delay* or endur* or extend* or fluctuat* or gradual* or lasting* or legacy* or lengthy* or linger* or long* or "medium* term*" or mediumterm* or multisystem* or "multi system*" or ongoing or permanent* or persist* or prolong* or protract* or relaps* or remission* or remit* or residual* or slow* or subacute* or "sub acute*") adj3 (complication? or consequence? or convalescen* or disabilit* or feature* or illness* or prognos* or sequela* or sign or signs or suffering? or symptom* or recuperat*)).ti.	200
14	11 or 12 or 13	2721
15	patient care/ or exp aftercare/ or exp rehabilitation/ or exp ambulatory care/	2401690
16	((clinical or patient or outpatient) adj1 (care? or "after care" or aftercare or follow-up or manag* or therap* or treat* or rehab or rehabilit* or habit* or service?)).ti,ab.	391619
17	15 or 16	2648017
18	14 and 17	557

19	limit 18 to (abstracts and english language and yr="2019 - Current")	440
20	limit 19 to conference abstract status	79
21	19 not 20	361
22	remove duplicates from 21	358

CINAHL

#	Query	Limiters/Expanders	Results
S1	((MH "COVID-19") OR (MH "SARS-CoV-2")) OR (MH "COVID-19 Pandemic")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	29,434
S2	((MH "Coronavirus+") OR (MH "Coronavirus Infections+")) AND (MH "Disease Outbreaks+")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	16,099
S3	TX (nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARSCOV2 or Severe Acute Respiratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syndrome Corona Virus 2 or coronavirus*)	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	63,273
S4	TX ((new or novel or "19" or "2019" or Wuhan or Hubei or China or Chinese) N3 (coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV))	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	12,357
S5	TX ((coronavirus* or corona virus* or betacoronavirus*) N3 (pandemic* or epidemic* or outbreak* or crisis))	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	6,737
S6	TX ((Wuhan or Hubei) N5 pneumonia)	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	367
S7	S1 OR S2 OR S3 OR S4 OR S5 OR S6	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	64,074

S8	<p>TI (((sequela# or long* or longterm or long-term or "medium* term*" or mediumterm or longtail or long-tail or longhaul* or long-haul* or long-last* or long-stand* or chronic* or "post acute" or post-acute or subacute or sub-acute or recurr* or "non recover*" or nonrecover* or "not recover*") N1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*"))) OR AB (((sequela# or long* or longterm or long-term or "medium* term*" or mediumterm or longtail or long-tail or longhaul* or long-haul* or long-last* or long-stand* or</p>	<p>Expanders - Apply equivalent subjects Search modes - Boolean/Phrase</p>	762
----	---	--	-----

	<p>chronic* or "post acute" or post-acute or subacute or sub-acute or recurr* or "non recover*" or nonrecover* or "not recover*") N1 (covid* or coronavirus* or corona* virus* or COV or "2019-nCoV*" or 2019nCoV* or "19-nCoV*" or 19nCoV* or nCoV2019* or "nCoV-2019*" or nCoV19* or "nCoV-19*" or "HCoV-19*" or HCoV19* or "HCoV-2019*" or HCoV2019* or "2019 novel*" or Ncov* or "n-cov" or "SARS-CoV-2*" or "SARSCoV-2*" or "SARSCoV2*" or "SARS-CoV2*" or SARSCov19* or "SARS-Cov19*" or "SARSCov-19*" or "SARS-Cov-19*" or SARSCov2019* or "SARSCov2019*" or "SARSCov-2019*" or "SARS-Cov-2019*" or SARS2* or "SARS-2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or SARScoronavirus2* or "SARS-coronavirus-2*" or "SARScoronavirus 2*" or "SARS coronavirus2*" or "severe acute respiratory syndrome*"))</p>		
S9	<p>TI (((post* OR chronic* OR continual OR continuing OR continuous OR delay* OR after OR endur* OR extend* OR fluctuat* OR following OR gradual* OR lasting OR legacy OR lengthy OR linger* OR long* OR mediumterm OR "medium term" OR multisystem* OR "multi system*" OR post-</p>	<p>Expanders - Apply equivalent subjects Search modes - Boolean/Phrase</p>	554

	<p>hospital* OR "post hospital*" OR "after hospital*" OR "follow* hospital*" OR post-discharg* OR "post discharg*" OR "after discharg*" OR "follow* discharg*" OR post-infect* OR "post infect*" OR "after infect*" OR "following infect*" OR post-viral OR "post viral" OR "after viral" OR "following viral" OR post-virus OR "post virus" OR recurr* OR relaps* OR extend* OR permanent OR persist* OR prolong* OR protract* OR ongoing OR recurring OR remit* OR residual OR recurrant* OR subacute OR "sub acute") N1 (covid* OR coronavirus* OR "corona* virus*" OR COV OR 2019-nCoV* OR 2019nCoV* OR 19-nCoV* OR 19nCoV* OR nCoV2019* OR nCoV-2019* OR nCoV19* OR nCoV-19* OR HCoV-19* OR HCoV19* OR HCoV-2019* OR HCoV2019* OR "2019 novel*" OR Ncov* OR n-cov OR SARS-CoV-2* OR SARSCoV-2* OR SARSCoV2* OR SARS-CoV2* OR SARSCov19* OR SARS-Cov19* OR SARSCov-19* OR SARS-Cov-19* OR SARSCov2019* OR SARSCov2019* OR SARSCov-2019* OR SARS-Cov-2019* OR SARS2* OR SARS-2* OR SARScoronavirus2* OR SARS-coronavirus-2* OR "SARScoronavirus 2*" OR "SARS coronavirus2*" OR SARScoronavirus2* OR SARS-coronavirus-2* OR "SARScoronavirus 2*" OR</p>		
--	---	--	--

	<p>"SARS coronavirus2*" OR "severe acute respiratory syndrome*" N3 (symptom* OR syndrome* OR complication# OR condition# OR comorbid* OR co-morbid* OR multimorbid* OR multi- morbid* OR disease* OR disorder* OR disabilit* OR illness* OR recuperat* OR sickness* OR sign OR signs OR suffering# OR survival))) OR AB (((post* OR chronic* OR continual OR continuing OR continuous OR delay* OR after OR endur* OR extend* OR fluctuat* OR following OR gradual* OR lasting OR legacy OR lengthy OR linger* OR long* OR medium term OR "medium term" OR multisystem* OR "multi system*" OR post- hospital* OR "post hospital*" OR "after hospital*" OR "follow* hospital*" OR post- discharg* OR "post discharg*" OR "after discharg*" OR "follow* discharg*" OR post- infect* OR "post infect*" OR "after infect*" OR "following infect*" OR post-viral OR "post viral" OR "after viral" OR "following viral" OR post- virus OR "post virus" OR recurr* OR relaps* OR extend* OR permanent OR persist* OR prolong* OR protract* OR ongoing OR recurring OR remit* OR residual OR recurran* OR subacute OR "sub acute") N1 (covid* OR coronavirus* OR "corona* virus*" OR COV OR 2019-nCoV* OR</p>		
--	--	--	--

	<p>2019nCoV* OR 19-nCoV* OR 19nCoV* OR nCoV2019* OR nCoV- 2019* OR nCoV19* OR nCoV-19* OR HCoV-19* OR HCoV19* OR HCoV- 2019* OR HCoV2019* OR "2019 novel*" OR Ncov* OR n-cov OR SARS-CoV-2* OR SARSCoV-2* OR SARSCoV2* OR SARS- CoV2* OR SARSCov19* OR SARS-Cov19* OR SARSCov-19* OR SARS- Cov-19* OR SARSCov2019* OR SARSCov2019* OR SARSCov-2019* OR SARS- Cov-2019* OR SARS2* OR SARS-2* OR SARScoronavirus2* OR SARS-coronavirus-2* OR "SARScoronavirus 2*" OR "SARS coronavirus2*" OR SARScoronavirus2* OR SARS-coronavirus-2* OR "SARScoronavirus 2*" OR "SARS coronavirus2*" OR "severe acute respiratory syndrome*" N3 (symptom* OR syndrome* OR complication# OR condition# OR comorbid* OR co-morbid* OR multimorbid* OR multi- morbid* OR disease* OR disorder* OR disabilit* OR illness* OR recuperat* OR sickness* OR sign OR signs OR suffering# OR survival)))</p>		
S10	S8 OR S9	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	1,194
S11	S7 AND S10	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	1,170
S12	(((MH "COVID-19") OR (MH "SARS-CoV-2")) OR	Expanders - Apply equivalent subjects	273

	(MH "COVID-19 Pandemic")) AND ((MH "Chronic Disease+") OR (MH "Recurrence+"))	Search modes - Boolean/Phrase	
S13	(((MH "COVID-19") OR (MH "SARS-CoV-2")) OR (MH "COVID-19 Pandemic")) AND TI ((chronic* OR continuous* OR continual* OR continuing* OR delay* OR endure* OR extend* OR fluctuate* OR gradual* OR lasting* OR legacy* OR lengthy* OR linger* OR long* OR "medium term*" OR "medium term*" OR multisystem* OR "multi system*" OR ongoing OR permanent* OR persist* OR prolong* OR protract* OR relapse* OR remission* OR remit* OR residual* OR slow* OR subacute* OR "sub acute*") N3 (complication# OR consequence# OR convalescence* OR disability* OR feature* OR illness* OR prognosis* OR sequela* OR sign OR signs OR suffering# OR symptom* OR recuperat*))	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	35
S14	S11 OR S12 OR S13	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	1,433
S15	(((MH "Patient Care+") OR (MH "After Care") OR (MH "Rehabilitation+")) OR (MH "Ambulatory Care Facilities+"))	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	1,089,078
S16	TI ((clinical OR patient OR outpatient) N1 (care# OR "after care" OR aftercare OR follow-up OR manage* OR therapy* OR treat* OR rehab OR rehabilit* OR habilit* OR	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	352,034

	service#)) OR AB ((clinical OR patient OR outpatient) N1 (care# OR "after care" OR aftercare OR follow-up ORmanag* OR therap* OR treat* OR rehab OR rehabilit* OR habilit* OR service#))		
S17	S15 OR S16	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	1,346,097
S18	S14 AND S17	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	369
S19	S14 AND S17	Limiters - Published Date: 20190101-20211231 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	365
S20	S14 AND S17	Limiters - Published Date: 20190101-20211231 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	365

Search terms used in various combinations in other resources:

- COVID
- Chronic symptoms or long-covid or longCov or longncov or long-term effects or long-term symptoms or post-acute or sequelae or chronic covid or long hauler or persistent symptoms or post-covid syndrome or longcoronavirus or post discharge or post infection or post viral or nonrecover or subacute or longtail
- Management or treatment or after care or therapeutic or therapy

Authorship & Contact

Authors:	Maeve McLean, Research Department, Saskatchewan Health Authority Hazel Williams-Roberts, Research Department, Saskatchewan Health Authority Brianna Howell-Spooner, Health Sciences Librarian, Saskatchewan Health Authority, v1
-----------------	--

Courtney Ellsworth, Health Sciences Librarian, Saskatchewan Health Authority,
v1

Peer Reviewers: Bruce Reeder, Community Health and Epidemiology Department, College of
Medicine, University of Saskatchewan

**For questions
about this review:** Dr. Gary Groot gary.groot@usask.ca



This work is licensed under the [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/). You are free to copy and distribute the work in any medium or format for non-commercial purposes, as long as you provide appropriate attribution to the Saskatchewan Health

Authority, do not adapt the work, and abide by the other license terms. To view a copy of this license, see <https://creativecommons.org/licenses/by-nc-nd/4.0/>. The license does not apply to SHA trademarks, logos or content for which the Saskatchewan Health Authority is not the copyright owner.

Disclaimer: This material is intended for general information only and is provided on an “as is,” “where is” basis. Although reasonable efforts were made to confirm the accuracy of the information, the Saskatchewan Health Authority and the Saskatchewan COVID Evidence Support Team does not make any representation or warranty, express, implied or statutory, as to the accuracy, reliability, completeness, applicability or fitness for a particular purpose of such information. This material is not a substitute for the advice of a qualified health professional. The Saskatchewan Health Authority expressly disclaims all liability for the use of these materials, and for any claims, actions, demands or suits arising from such use.

The authors declare they have no conflicts of interest to report.