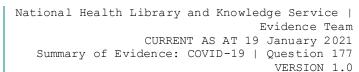The following information resources have been selected by the National Health Library and Knowledge Service Evidence Virtual Team in response to your question. In respect of the evolving global situation and rapidly changing evidence base, it is advised to use hyperlinked sources in this document to ensure that the information you are disseminating to the public or applying in clinical practice is the most current, valid and accurate. For further information on the methodology used in the compilation of this document — including a complete list of sources consulted — please see our National Health Library and Knowledge Service Summary of Evidence Protocol.

QUESTION [177]

What is the evidence for virtual early supported discharge of patients following COVID-19?

1

What is the evidence for virtual early supported discharge of patients following COVID-19?

Main Points

1. In a recent cohort study, almost ¼ of patients hospitalized with COVID-19 had increased care needs at discharge. Pre-admission frailty was strongly associated with increased care needs at discharge.
2. Comorbid conditions such as heart disease and diabetes may identify patient at greater risk of adverse events following discharge.
3. Remote patient monitoring of discharged COVID-19 patients may reduce the risk of hospital readmission. During the COVID-19 surge in New York City, lenient discharge criteria in conjunction with remote monitoring after discharge were associated with a rate of early readmissions after COVID-related hospitalizations that was comparable to the rate of readmissions after other reasons for hospitalization before the COVID pandemic.

Summary of Evidence

Cohen et al[3] recommend that after discharge from hospital clinician follow-up is warranted, either in the outpatient clinic or via tele-consultation. The authors note that the practice of sending patients home on supplemental oxygen is widely variable, and if carried out warrants close patient monitoring —— preferably via tele-monitoring. Post-Intensive Care Syndrome (PICS), a constellation of symptoms that includes a decline in physical, cognitive, and psychiatric function, may occur among some COVID-19 patients who have recovered from critical illness. In addition, some patients with more severe pulmonary involvement may have persistent pulmonary and respiratory symptoms, although there are no data regarding the long-term pulmonary sequelae of COVID-19.

Vilches-Moraga et al[18] note in their cohort study that 23.2% of patients hospitalized with COVID-19 had increased care needs at discharge. Pre-admission frailty was strongly associated with the need for an increased level of care at discharge, suggesting that frailty screening should be utilised for predictive modelling and early individualised discharge planning.

Bell et al[5] propose that rapid remote follow-up is a mechanism by which ambulatory patients can be clinically supported during the acute phase of illness, with benefits both to patient care and health service resilience.

Bowles et al[6] assert that the comorbid conditions of heart disease and diabetes as well as characteristics present at admission identify patients at greatest risk for an adverse event following discharge.

3

Crane et al[8] describe systems used to provide care to patients in the Mayo Clinic Health System, Minnesota, including: a centralized, nurse-led hotline to help screen patients who call and describe possible COVID-19 symptoms; virtual appointments to address patients' active symptoms while awaiting RE-PCR test; virtual patient visits; COVID-19 comprehensive care centre appointments for patients requiring imaging studies, laboratory testing or other in-person appointments; and use of remote patient monitoring as appropriate.

Remote patient monitoring of discharged COVID-19 patients decreased risk of readmission to the Emergency Department or hospital, and provided a scalable mechanism to monitor patients in their home environment with high patient satisfaction[4, 11, 12]. During the COVID-19 surge in New York City, lenient discharge criteria in conjunction with remote monitoring after discharge were associated with a rate of early readmissions after COVID-related hospitalizations that was comparable to the rate of readmissions after other reasons for hospitalization before the COVID pandemic[19]. Loubet et al[14] investigated the potential of a short messaging service (SMS) to monitor COVID-19 patients who risk clinical deterioration at home during the second week of illness and found that SMS tracking platforms could be useful as an early warning system to refer patients with worsening clinical status to hospital-based care.

Donno et al[10] propose a systematic management algorithm to guide health practitioners on the discharge and community reintegration of COVID-19 patients. Salawu et al[16] propose that tele-rehabilitation offers a quick and effective option to respond to the specialist rehabilitation needs of COVID-19 survivors following hospital discharge.

4

International Guidance

What does the World Health Organization say?

World Health Organisation (2020) Home care for patients with suspected or confirmed COVID-19 and management of their contacts[1]
This rapid advice is intended to guide public health and infection prevention and control (IPC) professionals, health facility managers, health workers and other trained community-based providers when addressing issues related to home care for patients with suspected or confirmed COVID-19.

What does the European Centre for Disease Prevention and Control say?

ECDC (2020) Guidance for discharge and ending of isolation of people with COVID-19[2]
The ECDC provides guidance for planning the discharge and ending of isolation of COVID-19 patients.
COVID-19 patients may be discharged based on criteria that take into account the following: a. clinical resolution of symptoms; b. time elapsed since onset of symptoms; c. severity of disease; d. immune status; and e. evidence of viral RNA clearance from the upper respiratory tract. Severely ill patients who need to be discharged from hospital before fulfilling the criteria for discharge and without a negative SARS-CoV-2 RT-PCR test result should self-isolate at home or at a safe place for at least 14 and up to 20 days from the onset of symptoms based on an individual case risk assessment. The assessment needs to take into account the presence of

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[1] World Health Organisation (2020). Home care for patients with suspected or confirmed COVID-19 and management of their contacts. https://www.who.int/publications/i/item/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts. [Accessed 15 January 2021]
[2] European Centre for Disease Prevention & Control (2020). Guidance for discharge and ending of isolation of people with COVID-19. https://www.ecdc.europa.eu/sites/default/files/documents/Guidance-for-discharge-and-ending-of-isolation-of-people-with-COVID-19.pdf. [Accessed 18 January 2021]

5

immunosuppression and whether the patient will be in contact with people who are vulnerable to severe COVID-19 or are in settings in which there is a risk of large outbreaks. Patients should seek medical advice if they develop symptoms again. Asymptomatic people who have had a positive SARS-CoV-2 test should self-isolate for 10 days from the date the sample was taken. Criteria for discharge and ending of isolation may be adapted for specific groups of patients. Two consecutive negative SARS-CoV-2 RT-PCR test results, ideally in a 24-hour period, are recommended for the discontinuation of isolation for immunocompromised cases. The second test is needed as confirmatory to exclude the possibility of a false negative result. Similarly, two consecutive negative SARS-CoV-2 RT-PCR tests can be considered for the discontinuation of isolation of severely ill patients, especially if they will be transferred to other units within the hospital or discharged to a long-term care facility. All patients who are instructed to complete quarantine at home or another safe place should follow infection prevention and control guidance with personal hygiene precautions in order to protect household contacts.

Point-of-Care Tools

What does UpToDate say?

[UpToDate (2020) Coronavirus Disease 2019 (COVID-19): Outpatient evaluation and management in adults](#)[3]
See Section: OUTPATIENT MANAGEMENT FOLLOWING INPATIENT OR ED DISCHARGE.

After discharge from the inpatient hospital setting or emergency department (ED), clinician follow-up is warranted, either in the outpatient clinic or via a telehealth visit. At each encounter after hospital or ED discharge, the authors reinforce the importance of infection control and provide counseling on the warning symptoms which should prompt re-evaluation.
In some cases, patients are discharged home or to supervised residential care from the inpatient hospital setting on low flow oxygen therapy, with oximetry monitoring by telehealth (preferred if available) or visiting nurse. The practice of sending patients home on supplemental oxygen is widely variable, however, and if carried out warrants close patient monitoring.
Some patients discharged from the hospital, including those with documented venous thromboembolism (VTE) as well as those who are at high risk for VTE, will be discharged on anticoagulation.
Post-intensive care syndrome (PICS), a constellation of symptoms that includes a decline in physical, cognitive, and psychiatric function, may occur among some COVID-19 patients who have recovered from critical illness. In addition, some patients with more severe pulmonary involvement may have persistent pulmonary and respiratory symptoms, although there are no data regarding the long-term pulmonary sequelae of COVID-19.

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[3] UpToDate (2020) Coronavirus disease 2019 (COVID-19).
https://www.uptodate.com/contents/coronavirus-disease-2019-covid-19-outpatient-evaluation-and-management-in-adults. [Accessed 15 January 2021]

Patients Discharged Home

☐ Most patients discharged from the inpatient setting require a follow-up clinician visit within one to two days following discharge; depending on their unique clinical and social situation, telehealth visit or in-person outpatient visit may be appropriate.

☐ For those patients evaluated and discharged from the ED and who are felt to need follow-up care, telehealth visits may also be appropriate. The timing of such visits, however, would vary depending upon patient acuity and indication.

Patients Discharged to Supervised Residential Care for Recovery

As part of the continuum of care of patients with COVID-19, temporary housing in supervised residential care facilities may also be appropriate for managing patients discharged from the inpatient hospital setting, as well as those evaluated and discharged from the ED. Depending on the type of facility, the patient's medical acuity, and available resources, telehealth follow-up may be appropriate; the intensity of telehealth follow-up will vary depending upon the indication for housing: eg solely the need for isolation versus isolation with more acute medical need.

International Literature

What does the international literature say?

Annis et al (2020) Rapid implementation of a COVID-19 remote patient monitoring program[4]

OBJECTIVE: The authors sought to evaluate early lessons from a remote patient monitoring engagement and education technology solution for patients with COVID-19 symptoms.

MATERIALS AND METHODS: A COVID-19-specific remote patient monitoring solution (GetWell Loop) was offered to patients with COVID-19 symptoms. The program engaged patients and provided educational materials and the opportunity to share concerns. Alerts were resolved through a virtual care workforce of providers and medical students.

RESULTS: Between March 18 and April 20, 2020, 2255 of 3701 (60.93%) patients with COVID-19 symptoms enrolled, resulting in over 2303 alerts, 4613 messages, 13 hospital admissions, and 91 emergency room visits. A satisfaction survey was given to 300 patient respondents, 74% of whom would be extremely likely to recommend their doctor.

DISCUSSION: The program provided a safe and satisfying experience for patients while minimizing COVID-19 exposure and in-person healthcare utilization.

CONCLUSIONS: Remote patient monitoring appears to be an effective approach for managing COVID-19 symptoms at home.

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[4] Annis T, Pleasants S, Hultman G, Lindemann E, Thompson JA, Billecke S, Badlani S, Melton GB. Rapid implementation of a COVID-19 remote patient monitoring program. J Am Med Inform Assoc. 2020 Aug 1;27(8):1326-1330. doi: 10.1093/jamia/ocaa097. PMID: 32392280; PMCID: PMC7239139.

Bell et al (2020) Implementation and evaluation of a COVID-19 rapid follow-up service for patients discharged from the emergency department[5]

The COVID-19 pandemic has necessitated rapid adaptation of healthcare providers to new clinical and logistical challenges. Following identification of high levels of emergency department (ED) re-attendance among patients with suspected COVID-19, the authors piloted a rapid remote follow-up service for this patient cohort. The authors present their service framework and evaluation of a pilot cohort of 192 patients. Patients were followed up by telephone within 36 hours of their ED attendance. Pulse oximetry was used for remote monitoring of a subset of patients. Patients required between one and six consecutive telephone assessments, dependent on illness severity, and 23 patients were recalled for in-person assessment. Approximately half of patients with confirmed or probable COVID-19 required onward referral for respiratory follow-up. This framework reduced unplanned ED re-attendances in comparison with a retrospective comparator cohort (4.7% from 22.6%). The authors reproduced these findings in a validation cohort with a high prevalence of acute COVID-19, managed through a clinic in September/October 2020, where an unplanned ED re-attendance rate of 5.2% was identified. The authors propose that rapid remote follow-up is a mechanism by which ambulatory patients can be clinically supported during the acute phase of illness, with benefits both to patient care and to health service resilience.

[5] Bell LC, Norris-Grey C, Luintel A, Bidwell G, Lanham D, Marks M, Baruah T, O'Shea L, Heightman M, Logan S. Implementation and evaluation of a COVID-19 rapid follow-up service for patients discharged from the emergency department. Clin Med (Lond). 2020 Dec 18:clinmed.2020-0816. doi: 10.7861/clinmed.2020-0816. Epub ahead of print. PMID: 33355255.[Accessed 18 January 2021]

Bowles et al (2020) Surviving COVID-19 After Hospital Discharge: Symptom, Functional, and Adverse Outcomes of Home Health Recipients[6]

BACKGROUND: Little is known about recovery from coronavirus disease 2019 (COVID-19) after hospital discharge.

OBJECTIVE: To describe the home health recovery of patients with COVID-19 and risk factors associated with re-hospitalization or death.

DESIGN: Retrospective observational cohort.

SETTING: New York City.

PARTICIPANTS: 1409 patients with COVID-19 admitted to home health care (HHC) between 1 April and 15 June 2020 after hospitalization.

MEASUREMENTS: Covariates and outcomes were obtained from the mandated OASIS (Outcome and Assessment Information Set). Cox proportional hazard models were used to estimate the hazard ratio (HR) of risk factors associated with re-hospitalization or death.

RESULTS: After an average of 32 days in HHC, 94% of patients were discharged and most achieved statistically significant improvements in symptoms and function. Activity-of-daily-living dependencies decreased from an average of 6 (95% CI, 5.9 to 6.1) to 1.2 (CI, 1.1 to 1.3). Risk for re-hospitalization or death was higher for male patients (HR, 1.45 [CI, 1.04 to 2.03]); White patients (HR, 1.74 [CI, 1.22 to 2.47]); and patients with heart failure (HR, 2.12 [CI, 1.41 to 3.19]), diabetes with complications (HR, 1.71 [CI, 1.17 to 2.52]), 2 or more emergency department visits in the past 6 months (HR, 1.78 [CI, 1.21 to 2.62]), pain daily or all the time (HR, 1.46 [CI, 1.05 to 2.05]), cognitive impairment (HR, 1.49 [CI, 1.04 to 2.13]), or functional dependencies (HR, 1.09 [CI, 1.00 to 1.20]). Eleven patients (1%) died, 137 (10%) were re-hospitalized, and 23 (2%) remain on service.

[6] Bowles KH, McDonald M, Barrón Y, Kennedy E, O'Connor M, Mikkelsen M. Surviving COVID-19 After Hospital Discharge: Symptom, Functional, and Adverse Outcomes of Home Health Recipients. Ann Intern Med. 2020 Nov 24:M20-5206. doi: 10.7326/M20-5206. Epub ahead of print. PMID: 33226861; PMCID: PMC7707212. [Accessed 14 January 2021]

11

LIMITATIONS: Care was provided by 1 home health agency. Information on re-hospitalization and death after HHC discharge is not available.

CONCLUSION: Symptom burden and functional dependence were common at the time of HHC admission but improved for most patients. Comorbid conditions of heart failure and diabetes, as well as characteristics present at admission, identified patients at greatest risk for an adverse event.

Bruni (2020) Telemedicine-enabled Accelerated Discharge of Patients Hospitalized with COVID-19 to Isolation in Repurposed Hotel Rooms[7]

The proposed model requires accelerating discharge of low-dependency patients into isolation. Patients who can be discharged faster to release low-dependency hospital beds are primarily recovering from COVID-19 and awaiting a PCR-negative swab result before leaving isolation rooms. These patients often cannot be discharged to their homes for at least one of two reasons: 1. because of the risk of infecting their cohabitants, as achieving proper isolation in homes with more than one resident is often logistically extremely difficult, and cohabitants often include highly susceptible, older people or those with underlying conditions, especially if the patient resides in a care home; or 2. patients may require ongoing monitoring of vital signs before being fit for discharge. Telemonitoring guaranteed during the period of infection makes the hospital physician more comfortable to quickly discharge a patient who recently had pneumonia and low SaO2. The model proposed enables these patients to continue isolation safely in a medically monitored environment, avoiding the adverse clinical consequences of discharging still-infectious individuals to their homes and care homes.

[7] Bruni T, Lalvani A, Richeldi L. Telemedicine-enabled Accelerated Discharge of Patients Hospitalized with COVID-19 to Isolation in Repurposed Hotel Rooms. Am J Respir Crit Care Med. 2020 Aug 15;202(4):508-510. doi: 10.1164/rccm.202004-1238OE. Erratum in: Am J Respir Crit Care Med. 2020 Dec 1;202(11):1608-1609. PMID: 32543906; PMCID: PMC7427391.[Accessed 18 January 2021]

Crane et al (2020) Telemedicine Consultations and Follow-up of Patients With COVID-19[8]

The coronavirus disease 2019 (COVID-19) pandemic has created a need and opportunity for telemedicine consultations. The risk of disease transmission to patients without COVID-19 and to health care workers has stimulated health care institutions to identify new ways to track and follow-up individuals with potential or proven COVID-19. The authors describe systems used to provide care to patients in the Mayo Clinic Health System – Southeast Minnesota region including:

- ☐ a centralized, nurse-led hotline to help screen patients who call and describe possible COVID-19 symptoms
- ☐ virtual appointments to address patients' active symptoms while waiting for a RT-PCR test
- ☐ virtual patient visits —— by video as a preference
- ☐ COVID-19 comprehensive care centre appointments for patients requiring imaging studies, laboratory testing or other-in-person appointments
- ☐ referral to the COVID-19 frontline care team for patients with a positive RT-PCR test result
- ☐ use of remote patient monitoring as appropriate

Demeco et al (2020) Rehabilitation of patients post-COVID-19 infection: a literature review[9]

Rehabilitation is important for patients with coronavirus disease 2019 (COVID-19) infection. The authors conducted a literature review and included randomized trials, recommendations, quasi-randomized or prospective controlled clinical trials, reports, guidelines, field updates, and letters to the editor. The authors identified 107 studies, of which 85 were excluded after

[8] Crane SJ, Ganesh R, Post JA, Jacobson NA. Telemedicine Consultations and Follow-up of Patients With COVID-19. Mayo Clin Proc. 2020 Sep;95(9S):S33-S34. doi: 10.1016/j.mayocp.2020.06.051. Epub 2020 Jul 27. PMID: 32948258; PMCID: PMC7383136. [Accessed 18 January 2021]
[9] Demeco A, Marotta N, Barletta M, Pino I, Marinaro C, Petraroli A, Moggio L, Ammendolia A. Rehabilitation of patients post-COVID-19 infection: a literature review. J Int Med Res. 2020 Aug;48(8):300060520948382. doi: 10.1177/0300060520948382. PMID: 32840156; PMCID: PMC7450453. [Accessed 14 January 2021]

14

screening the full text or abstract. In total, 22 studies were included.

The complexity of the clinical setting and the speed of spread of SARS-CoV-2, which leads to rapid occupation of beds in the Intensive Care Unit, make it necessary to discharge patients with COVID-19 who have mild symptoms as soon as possible. For these reasons, it is necessary to formulate rehabilitation programs for these patients, to help them restore physical and respiratory function and to reduce anxiety and depression, particularly patients with comorbidities and those who live alone or in rural settings, to restore a good quality of life.

Donno et al (2020) An original logigramme to make safe discharge and community reintegration for COVID-19 patients[10]

The authors propose a systematic management algorithm dedicated to COVID-19 patients to guide health practitioners on the discharge and community reintegration of COVID-19 patients. After discharge, 14 days of further isolation with regular health monitoring and, finally, the execution of a nasopharyngeal swab for identification of SARS-CoV-2 viral RNA are recommended. Home-cared patients should be placed in isolation for a further 7 days after at least 2 negative RT-PCR tests. The algorithm is already used in the Department of Prevention - Local Health Agency of Lecce (Apulia) but will be updated according to the latest research findings.

Gordon et al (2020) Remote Patient Monitoring Program for Hospital Discharged COVID-19 Patients[11]

OBJECTIVE: To monitor patients with COVID-19 upon hospital discharge via a remote patient monitoring (RPM) program. The authors describe the patient

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[10] Donno F, Fedele A. An original logigramme to make safe discharge and community reintegration for COVID-19 patients. J Prev Med Hyg. 2020 Oct 6;61(3):E313-E320. doi: 10.15167/2421-4248/jpmh2020.61.3.1597. PMID: 33150220; PMCID: PMC7595062.
[11] Gordon WJ, Henderson D, DeSharone A, Fisher HN, Judge J, Levine DM, MacLean L, Sousa D, Su MY, Boxer R. Remote Patient Monitoring Program for Hospital Discharged COVID-19 Patients. Appl Clin Inform. 2020 Oct;11(5):792-801. doi: 10.1055/s-0040-1721039. Epub 2020 Nov 25. PMID: 33241547; PMCID: PMC7688410. [Accessed 13 January 2021]

15

characteristics, program characteristics, and clinical outcomes of patients in the RPM program.

METHODS: COVID-19 patients discharged home from hospital were enrolled in the study. Enrolled patients had an app, and were provided with a pulse oximeter and thermometer. Patients self-reported symptoms, O2 saturation and temperature daily. Abnormal symptoms or vital signs were flagged and assessed by a pool of nurses. Descriptive statistics were used to describe patient and program characteristics. A mixed-effects logistic regression model was used to determine the odds of a combined endpoint of emergency department (ED) or hospital readmission.

RESULTS: A total of 295 patients were referred for RPM from 5 participating hospitals, and 225 patients were enrolled. A majority of enrolled patients (66%) completed the monitoring period without triggering an abnormal alert. Enrolment was associated with decreased odds of ED or hospital readmission (adjusted odds ratio (OR): 0.54; 95% confidence interval (CI): 0.3-0.97; p = 0.039). Referral without enrolment was not associated with reduced odds of ED or hospital readmission.

CONCLUSION: RPM for COVID-19 provides a mechanism to monitor patients in their home environment and reduce hospital utilization. RPM reduces readmissions for patients with COVID-19 and provides scalable remote monitoring capabilities upon hospital discharge. RPM for post-discharge patients with COVID-19 was associated with a decreased risk of readmission to the ED or hospital, and provided a scalable mechanism to monitor patients in their home environment.

Kodama et al (2020) Reengineering the Discharge Transition Process of COVID-19 Patients Using Telemedicine, Remote Patient Monitoring, and Around-the-Clock Remote Patient Monitoring from the Emergency Department and Inpatient Units[12]

[12] Kodama R, Arora S, Anand S, Choudhary A, Weingarten J, Francesco N, Chiricolo G, Silber S, Mehta PH. Reengineering the Discharge Transition Process of COVID-19 Patients Using Telemedicine, Remote Patient Monitoring, and Around-the-Clock Remote Patient Monitoring from the Emergency Department and Inpatient Units. Telemed J E Health. 2020 Dec 14. doi: 10.1089/tmj.2020.0459. Epub ahead of print. PMID: 33320031.[Accessed 18 January 2021]

BACKGROUND: At the beginning of the COVID-19 pandemic, New York City quickly became an epicenter with hospitals at full capacity needing to care for patients. The authors developed an innovative system of safely discharging the massive influx of patients. Inundation of patient care with limited manpower and resources forced the hospital to align with a third-party vendor, Around-the-Clock Alert, to make remote patient monitoring (RPM) possible. Each patient was prescribed a pulse oximeter and nurses were assigned to monitor vital signs, speak to patients, and escalate to physicians if required. RESULTS: 50 patients were enrolled, of whom 13 were escalated, resulting in 3 Emergency Room visits and 1 readmission. A high compliance rate was observed, with high patient satisfaction levels in post-surveys. DISCUSSION: The program was unique in that it utilized telemedicine for regular patient follow-up, along with RPM through a third-party vendor. Patients were able to be safely discharged home with close follow-up through regularly obtained vitals with access to a 24/7 hotline for any emergencies, possibly preventing readmissions. Limitations include a small sample size population. CONCLUSIONS: In a short period despite lack of resources, telehealth and RPM's concurrent use with a third-party vendor could be successfully utilized for safe discharges with high patient satisfaction.

Loerinc et al (2020) Discharge characteristics and care transitions of hospitalized patients with COVID-19[13]

Little is known about the follow-up healthcare needs of patients hospitalized with coronavirus disease 2019 (COVID-19) after hospital discharge. Due to the unique circumstances of providing transitional care in a pandemic, post-discharge providers must adapt to specific needs and limitations identified for the care of COVID-19 patients. The authors conducted a retrospective chart review of all hospitalized COVID-19 patients discharged from an Emory Healthcare Hospital in Atlanta, Georgia, US

[13] Loerinc LB, Scheel AM, Evans ST, Shabto JM, O'Keefe GA, O'Keefe JB. Discharge characteristics and care transitions of hospitalized patients with COVID-19. Healthc (Amst). 2020 Dec 24;9(1):100512. doi: 10.1016/j.hjdsi.2020.100512. Epub ahead of print. PMID: 33383393. [Accessed 14 January 2021]

17

from March 26 to April 21, 2020 to characterize their post-discharge care plans. A total of 310 patients were included in the study (median age 58, range: 23-99; 51.0% female; 69.0% African American). The most common presenting comorbidities were hypertension (200, 64.5%), obesity (BMI≥30) (138, 44.5%), and diabetes mellitus (112, 36.1%). The median length of hospitalization was 5 days (range: 0-33). Sixty-seven patients (21.6%) were admitted to the Intensive Care Unit and 42 patients (13.5%) received invasive mechanical ventilation. The most common complications recorded at discharge were electrolyte abnormalities (124, 40.0%), acute kidney injury (86, 27.7%) and sepsis (55, 17.7%). The majority of patients were discharged directly home (281, 90.6%). Seventy-five patients (24.2%) required any home service including home health and home oxygen therapy. The most common follow-up need was an appointment with a primary care provider (258, 83.2%). Twenty-four patients (7.7%) had one or more visit to an ED after discharge and 16 patients (5.2%) were readmitted.

Loubet et al (2020) Use of short message service in at-home COVID-19 patient management[14]

BACKGROUND: Mobile health innovations are well adapted for ambulatory COVID-19 patients who risk clinical deterioration at home during the second week of illness. METHODS: A short message service (SMS) communication program was implemented by French physicians to monitor COVID-19 patients after discharge from outpatient or emergency care. The aim of the SMS tracking is to advise patients about their need for medical reassessment if reporting worsening of COVID-19 symptoms. A follow-up via SMS to all confirmed positive patients in the Nîmes area (France) was established. Every morning, patients received four follow-up questions. Daily responses were converted to green, orange or red trees, analysed in real time by physicians. "Red" patients were called immediately to check their condition and organise

[14] Loubet P, Czeschan C, Sintes M, Sotto A, Laureillard D. Use of short message service in at-home COVID-19 patient management. BMC Med. 2020 Dec 16;18(1):391. doi: 10.1186/s12916-020-01863-9. PMID: 33323098; PMCID: PMC7738241.[Accessed 14 January 2021]

transfer to hospital if needed. "Orange" patients were called within two hours to verify whether the specific instructions following the SMS had been followed.
RESULTS: From March 21 to June 30, 2020, 1007 patients agreed to sign up to the SMS tracking, 62% were women and the mean age was 41.5 years (standard deviation (SD) 16.0). During follow-up, 649 (64%) became "orange" and 69 (7%) "red". Ten patients were directly admitted to the Infectious Diseases Department during their follow-up due to clinical worsening, all but one as a result of SMS alerts and subsequent telephone assessment by physicians.
CONCLUSION: SMS tracking platforms could be useful as an early warning system to refer patients with worsening clinical status to hospital-based care or additional clinician advice.

Pimlott (2020) Clinical learnings from a virtual primary care program monitoring mild to moderate COVID-19 patients at home[15]

BACKGROUND: Virtual consults have replaced in-person visits for many home-isolated patients with COVID-19 disease.
OBJECTIVES: To describe the natural history, clinical management and outcomes of community-dwelling patients with COVID-19 who received support from a family medicine-led, virtual COVIDCare@Home program in Toronto, Ontario, Canada.
METHODS: Observational, descriptive study conducted by retrospective chart review of 98 patients enrolled during the first 5 weeks of program implementation (8 April-11 May 2020); 73 patients with laboratory-confirmed COVID-19, with symptom onset ≤ 14 days before initial consult were included for analysis. Patients were classified as mild, moderate or severe based on WHO Criteria.
RESULTS: All patients in the program experienced mild (88%) or moderate (12.3%) disease. No patients were hospitalized or died. Patients were mainly female (70%); with mean age of 43.3 years. Most patients (82.2%) worked

[15] Pimlott N, Agarwal P, McCarthy LM, Luke MJ, Hum S, Gill S, Heisey R. Clinical learnings from a virtual primary care program monitoring mild to moderate COVID-19 patients at home. Fam Pract. 2020 Dec 19:cmaa130. doi: 10.1093/fampra/cmaa130. Epub ahead of print. PMID: 33340398.[Accessed 18 January 2021]

19

in higher risk, healthcare settings. Almost 40% had no medical co-morbidities. Common symptoms were cough (65.8%), fatigue (60.3%), headache (42.5%) and myalgia (39.7%), followed by fever (32.9%), sore throat (21.9%), nasal congestion (21.9%) and rhinorrhea (20.5%). Headache (51%) and anosmia (45.1%) were common among females; fever and breathlessness among males (40.9%). Nine patients (12.3%) experienced worsening of symptoms (mainly respiratory) or exacerbation of co-morbidities, which required care outside the virtual service. CONCLUSION: Patients with mild to moderate COVID-19 disease can be managed safely and effectively in a family medicine-led virtual program. Some sex differences in symptoms were observed.

Salawu et al (2020) A Proposal for Multidisciplinary Tele-Rehabilitation in the Assessment and Rehabilitation of COVID-19 Survivors[16]

About half of COVID-19 survivors have residual functional deficits that require multidisciplinary specialist rehabilitation. The workforce to deliver the required rehabilitation input is beyond the capacity of existing community services. Strict medical follow-up guidelines to monitor these patients mandate scheduled reviews within 12 weeks post discharge. Due to the restricted timeframe for these events to occur, existing care pathways are unlikely to be able to meet the demand. An innovative integrated post-discharge care pathway to facilitate follow up by acute medical teams and a specialist multidisciplinary rehabilitation team is proposed. Such a pathway will enable the monitoring and provision of comprehensive medical assessments and multidisciplinary rehabilitation. The authors propose that tele-rehabilitation offers a quick and effective option to respond to the specialist rehabilitation needs of COVID-19 survivors following hospital discharge.

[16] Salawu A, Green A, Crooks MG, Brixey N, Ross DH, Sivan M. A Proposal for Multidisciplinary Tele-Rehabilitation in the Assessment and Rehabilitation of COVID-19 Survivors. Int J Environ Res Public Health. 2020 Jul 7;17(13):4890. doi: 10.3390/ijerph17134890. PMID: 32645876; PMCID: PMC7369849.[Accessed 18 January 2021]

20

Shah (2020) Novel Use of Home Pulse Oximetry Monitoring in COVID-19 Patients Discharged From the Emergency Department Identifies Need for Hospitalization[17]

OBJECTIVES: To evaluate patient-reported oxygen saturation (SpO2) using pulse oximetry as a home monitoring tool for patients with initially non-severe COVID-19 to identify need for hospitalization.

METHODS: Patients were enrolled at the emergency department (ED) and outpatient testing centers. Each patient was given a home pulse oximeter and instructed to record their SpO2 every 8 hours. Patients were instructed to return to the ED for sustained home SpO2 < 92% or if they felt they needed emergent medical attention. Relative risk was used to assess the relation between hospitalization and home SpO2 < 92% in COVID-19-positive patients.

RESULTS: 209 patients with suspected COVID-19 were enrolled, of whom 77 patients tested positive for COVID-19 and were included. Subsequent hospitalization occurred in 22 of 77 (29%) patients. Resting home SpO2 < 92% was associated with an increased likelihood of hospitalization compared to SpO2 $\geq$ 92% (relative risk = 7.0, 95% confidence interval = 3.4 to 14.5, p < 0.0001). Home SpO2 < 92% was also associated with increased risk of Intensive Care Unit admission, acute respiratory distress syndrome, and septic shock. In the study cohort, 50% of patients who ended up hospitalized only returned to the ED for incidental finding of low home SpO2 without worsening of symptoms. One-third (33%) of non-hospitalized patients stated that they would have returned to the ED if they did not have a pulse oximeter to reassure them at home.

CONCLUSIONS: Home pulse oximetry monitoring identifies need for hospitalization in initially non-severe COVID-19 patients when a cutoff of SpO2 92% is used. Half of patients who ended up hospitalized had SpO2 < 92% without

[17] Shah S, Majmudar K, Stein A, Gupta N, Suppes S, Karamanis M, Capannari J, Sethi S, Patte C. Novel Use of Home Pulse Oximetry Monitoring in COVID-19 Patients Discharged From the Emergency Department Identifies Need for Hospitalization. Acad Emerg Med. 2020 Aug;27(8):681-692. doi: 10.1111/acem.14053. Epub 2020 Jul 23. PMID: 32779828; PMCID: PMC7323027.[Accessed 15 January 2021]

worsening symptoms. Home SpO2 monitoring also reduces unnecessary ED revisits.

Vilches-Moraga et al (2020) Increased care at discharge from COVID-19: The association between pre-admission frailty and increased care needs after hospital discharge; a multicentre European observational cohort study[18]

BACKGROUND: The COVID-19 pandemic has placed significant pressure on health and social care. Survivors of COVID-19 may be left with substantial functional deficits requiring ongoing care. The authors aimed to determine whether pre-admission frailty was associated with increased care needs at discharge for patients admitted to hospital with COVID-19.

METHODS: Patients were included if aged over 18 years old and admitted to hospital with COVID-19 between 27 February and 10 June 2020. The Clinical Frailty Scale (CFS) was used to assess pre-admission frailty status. Admission and discharge care levels were recorded. Data were analysed using a mixed-effects logistic regression adjusted for age, sex, smoking status, comorbidities and admission CRP as a marker of severity of disease.

RESULTS: Thirteen hospitals included patients: 1671 patients were screened, and 840 were excluded including, 521 patients who died before discharge (31.1%). Of the 831 patients who were discharged, the median age was 71 years (IQR, 58-81 years) and 369 (44.4%) were women. The median length of hospital stay was 12 days (IQR 6-24). Using the CFS, 438 (47.0%) were living with frailty (≥ CFS 5), and 193 (23.2%) required an increase in the level of care provided. Multivariable analysis showed that frailty was associated with an increase in care needs compared to patients without frailty (CFS 1-3). The adjusted odds ratios (aOR) were as follows: CFS 4, 1.99 (0.97-4.11); CFS 5, 3.77 (1.94-7.32); CFS 6, 4.04 (2.09-

[18] Vilches-Moraga A, Price A, Braude P, Pearce L, Short R, Verduri A, Stechman M, Collins JT, Mitchell E, Einarsson AG, Moug SJ, Quinn TJ, Stubbs B, McCarthy K, Myint PK, Hewitt J, Carter B; COPE Study. Increased care at discharge from COVID-19: The association between pre-admission frailty and increased care needs after hospital discharge; a multicentre European observational cohort study. BMC Med. 2020 Dec 18;18(1):408. doi: 10.1186/s12916-020-01856-8. PMID: 33334341; PMCID: PMC7746415.[Accessed 15 January 2021]

7.82); CFS 7, 2.16 (1.12-4.20); and CFS 8, 3.19 (1.06-9.56).

CONCLUSIONS: Around a quarter of patients admitted with COVID-19 had increased care needs at discharge. Pre-admission frailty was strongly associated with the need for an increased level of care at discharge. The results have implications for service planning and public health policy as well as a person's functional outcome, suggesting that frailty screening should be utilised for predictive modelling and early individualised discharge planning.

Ye et al (2021) Hospital Readmissions After Implementation of a Discharge Care Program for Patients with COVID-19 Illness[19]

BACKGROUND: The surge of coronavirus 2019 (COVID-19) hospitalizations in New York City required rapid discharges to maintain hospital capacity.

OBJECTIVE: To determine whether lenient provisional discharge guidelines with remote monitoring after discharge resulted in safe discharges home for patients hospitalized with COVID-19 illness.

DESIGN: Retrospective case series.

SETTING: Tertiary care medical center.

PATIENTS: Consecutive adult patients hospitalized with COVID-19 illness between March 26, 2020, and April 8, 2020, with a subset discharged home.

INTERVENTIONS: COVID-19 Discharge Care Program consisting of lenient provisional inpatient discharge criteria and option for daily telephone monitoring for up to 14 days after discharge. MEASUREMENTS: Fourteen-day emergency department (ED) visits and hospital readmissions.

RESULTS: Among 812 patients with COVID-19 illness hospitalized during the study time period, 15.5% died prior to discharge, 24.1% remained hospitalized, 10.0% were discharged to another facility, and 50.4% were discharged home. Characteristics of the 409 patients discharged home were mean (SD) age 57.3 (16.6) years; 245 (59.9%) male; 27 (6.6%) with temperature ≥ 100.4 F; and 154 (37.7%) with oxygen saturation < 95% on day of discharge. Over 14 days of follow-up, 45 patients (11.0%) returned to the ED, of whom 31 patients (7.6%) were readmitted. Compared to patients not referred, patients referred for remote monitoring had fewer ED visits (8.3% vs 14.1%; OR 0.60, 95% CI 0.31-1.15, p = 0.12) and readmissions (6.9% vs 8.3%; OR 1.15, 95% CI 0.52-2.52, p = 0.73).

LIMITATIONS: Single-center study; assignment to remote monitoring was not randomized.

[19] Ye S, Hiura G, Fleck E, Garcia A, Geleris J, Lee P, Liyanage-Don N, Moise N, Schluger N, Singer J, Sobieszczyk M, Sun Y, West H, Kronish IM. Hospital Readmissions After Implementation of a Discharge Care Program for Patients with COVID-19 Illness. J Gen Intern Med. 2021 Jan 14:1-8. doi: 10.1007/s11606-020-06340-w. Epub ahead of print. PMID: 33443699; PMCID: PMC7808120.

24

CONCLUSIONS: During the COVID-19 surge in New York City, lenient discharge criteria in conjunction with remote monitoring after discharge were associated with a rate of early readmissions after COVID-related hospitalizations that was comparable to the rate of readmissions after other reasons for hospitalization before the COVID pandemic.

Other

Alberta Health Services (2020) Are there criteria or simple tools that can be used to determine which patients with suspected / confirmed COVID-19 are stable and appropriate for safe discharge from hospital or an alternate care centre? What follow-up is required?[20]
Rapid evidence summary looking at discharge criteria, and follow-up care for individuals with suspected or confirmed COVID-19.

National Health Service (2020) Novel coronavirus (COVID-19) standard operating procedure: COVID virtual ward[21]
Outlines the COVID virtual ward model as an option for clinicians to admit to for earlier safe and supported discharge.

McGregor et al (2021) [Clinical Trial] Rehabilitation Exercise and psycholoGical support After COVID-19 InfectioN' (REGAIN): a structured summary of a study protocol for a randomised controlled trial[22]
The primary objective of the trial will be to determine which of two interventions is the most clinically and cost-effective treatment for people with ongoing COVID-19 sequelae more than three months after hospital discharge: 1. an eight week, online, home-based, supervised, group rehabilitation programme (REGAIN); or 2. a single online session of advice [best-practice usual care].

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[20] Alberta Health Services COVID 19 Scientific Advisory Group. Are there criteria or simple tools that can be used to determine which patients with suspected / confirmed COVID-19 are stable and appropriate for safe discharge from hospital or an alternate care centre? What follow-up is required? https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-COVID-19-sag-criteria-for-safe-discharge-from-hospital-rapid-review.pdf [Accessed 18 January 2021]

[21] National Health Service. Novel coronavirus (COVID-19) standard operating procedure: COVID virtual ward. https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2021/01/C1042-sop-discharge-COVID-virtual-ward-13-jan-21.pdf [Accessed 18 January 2021]

[22] McGregor G, Sandhu H, Bruce J, Sheehan B, McWilliams D, Yeung J, Jones C, Lara B, Smith J, Ji C, Fairbrother E, Ennis S, Heine P, Alleyne S, Guck J, Padfield E, Potter R, Mason J, Lall R, Seers K, Underwood M. Rehabilitation Exercise and psycholoGical support After COVID-19 InfectioN' (REGAIN): a structured summary of a study protocol for a randomised controlled trial. Trials. 2021 Jan 6;22(1):8. doi: 10.1186/s13063-020-04978-9. PMID: 33407804; PMCID: PMC7785779.[Accessed 15 January 2021]

The following search strategy was used:

> coronavirus.ab,ti. | "corona virus".ab,ti. | (Wuhan adj3 virus).ab,ti. | ("2019-nCoV" or "2019 ncov").ab,ti. | "severe acute respiratory syndrome coronavirus 2".ab,ti. | ("2019" and (new or novel) and coronavirus).ab,ti. | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 | AND (hospital discharge/ OR patient discharge/ OR aftercare/methods OR early discharge.ab,ti. OR supported discharge. Ab,ti.) AND (telemedicine/ OR telemetry/ OR ("wearable device*" or app or application or "artificial intelligence" or "live streaming" or webcam* or Zoom or Facetime or Skype.ab,ti) OR ((mobile adj3 health*) or mhealth.ab,ti)) OR videoconsult*.ab,ti. OR ((virtual or remote or digital or computer or online or interent or web or video) adj3 (clinic* or consult*)

[†] Julia Reynolds, Librarian Mayo University Hospital [Author]; Brendan Leen, Area Library Manager, HSE South [Editor]

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