






Research Article

Post-discharge evaluation of patients with Covid-19 infection

Covid-19 enfeksiyonu olan hastaların taburculuk sonrası değerlendirilmesi

 Adil Cetin ^a,  Mebrure Beyza Gokcek ^a,  Humeyra Aslaner ^b,  Zeliha Kaya Erten ^c,  Aysenur Canan Ozcakir ^d

^a Department of Family Medicine, Kayseri Provincial Health Directorate, Kayseri, Turkey

^b Department of Family Medicine, Kayseri City Hospital, Kayseri, Turkey

^c Department of Nursing, Faculty of Health Sciences, Nuh Naci Yazgan University, Kayseri, Turkey

^d Department of Physiotherapy, Institute of Health Sciences, Pamukkale University, Denizli, Turkey

Abstract

Introduction: This study was conducted retrospectively, cross-sectional and descriptively to evaluate the telemonitoring results of discharged patients who had been hospitalized due to Covid-19 during the pandemic.

Methods: This study was composed of data which were obtained through the folders of 862 patients who had gotten their Covid-19 Polymerase Chain Reaction (PCR) tests positive, were treated in hospital and discharged between 28.08.2020 and 16.09.2020. This study was completed with folders of 760 patients whose data were overall. Descriptive statistics were given as mean, standard deviation, median, minimum and maximum. Percentages were used for categorical data. Also, the Chi-Square test was used to determine differences between the groups in categorical variables. Kolmogorov-Smirnov test was used so as to analyze normal distribution of data.

Results: In the study, the age median of patients who stated their clinical condition as good and average, was lower compared to patients whose clinical status was bad ($p=0.001$). 45% of patients with poor condition were rehospitalized and 35% of them were directed to emergency service ($p<0.001$).

Conclusions: Results have demonstrated that even if those patients were discharged, their problems still continued in their homes, and they need support. Moreover, it is considered that home-monitoring and home attendant care services for elderly patients have to be improved qualitatively.

Keywords: Covid-19, Home Care, Discharge Period

Öz


Giriş: Bu çalışma, pandemi sırasında Covid-19 nedeni ile hastanede tedavi edilip taburcu olan hastaların telefonla izlem sonuçlarını değerlendirmek amacı ile retrospektif kesitsel tanımlayıcı olarak yapılmıştır.

Yöntem: Bu çalışma 28.08.2020 ile 16.09.2020 tarihleri arasında Covid-19 Polymerase Chain Reaction (PCR) testi pozitif olan hastanede tedavi gördükten sonra taburcu edilen 862 hastanın dosyasından elde edilen verilerle oluşturulmuştur. Bu çalışma, verisi tam olan 760 hastanın dosyası ile tamamlanmıştır. Tanımlayıcı istatistikler ortalama, standart deviasyon, medyan, minimum ve maksimum olarak verilmiştir. Kategorik veriler için yüzdelik kullanılmıştır. Ayrıca kategorik değişkenlerdeki gruplar arası farkı belirlemek için Ki-Kare testi kullanılmıştır. Verilerin normal dağılımını incelemek amacı ile Kolmogorov-Smirnov testi kullanılmıştır.

Bulgular: Çalışmada; klinik durumunu iyi ve orta olarak değerlendiren hastaların yaş ortancası, klinik durumu kötü olan hastalara göre daha düşüktü ($p=0.001$). Klinik durumu kötü olanların %45'i tekrar hospitalize edilmiş ve %35'i acil servise yönlendirilmiştir ($p<0.001$).

Sonuç: Sonuçlar; bize hastalar taburcu olsa da onların sorunlarının evde hala devam ettiğini ve desteğe ihtiyaçları olduğunu göstermektedir. Ayrıca yaşlı hastalara verilen evde izlem ve bakım uygulamalarının niteliğinin artırılması gerektiği düşünülmüştür.

Anahtar kelimeler: Covid-19, Evde Bakım, Taburcu Sonrası Dönem

Received	Accepted	Published Online	Corresponding Author	E-mail
August 18, 2021	February 21, 2022	March 17, 2022	Mebrure Beyza Gokcek, M.D.	beyzaozgun@gmail.com
Correspondence	Dr. Mebrure Beyza GÖKÇEK, Hunat Mah. Nuh Naci Yazgan Caddesi No:2 38030 Melikgazi / Kayseri-Turkey			
	https://doi.org/10.22391/fppc.983957			

Introduction

In December 2019, an outbreak of the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) epidemic has occurred in Wuhan city of Hubei province of China [1]. The virus was determined to be infected by droplets and contact, and it was declared as a pandemic by the World Health Organization on 11th March 2020 [2].

The clinical spectrum of Coronavirus disease (Covid-19) varies from asymptomatic cases to critically sick cases. Fever and coughing have been the most common symptoms among symptomatic adults. The course of the disease is identified to be riskier, especially in elderlies and patients with chronic conditions. As a result of elderly patients being more fragile and more vulnerable to infections, Covid-19 infections in elderly patients' progress is quite influential and severe [3,4]. It was observed that geriatric patients especially with chronic diseases had affected severely by the progress of Covid-19 infection and it caused irreversible organ damage in them. [5]. In this context, hospital stays, and the following monitoring became even more critical due to the mentioned condition of the elderlies and patients with chronic diseases and the ease of transmission of the disease [3].

The rapid increase of patient numbers has aggravated the operation health systems in many countries, especially in Europe, and services nearly came to a standstill in some hospitals. As a result, some patients were forced to be discharged early and these patients were tried to be monitored in their homes by medical teams. However; these early discharging situations caused some unintended medical problems in homes [6].

A range of studies reviewed the symptoms and characteristics of adults with Covid-19. However, the differences among countries in the progress of the disease, monitoring process in hospitals and treatments, detailed studies on post-discharge problems of patients were not yet included. We believe that efficient monitoring of patients in their homes and successfully redressing of problems about quarantines and the progress of the disease can help decrease recurring hospital admissions and rehospitalizations. In this prospect, the home attendant care unit of the Provincial Health Directorate of Kayseri makes phone calls to patients in the post-discharge period, thus they monitor their problems and overall medical conditions. Then, if needed, medical teams, in which doctors take part, make home visits.

Methods

Our study is conducted with a retrospective, cross-sectional and descriptive design, to evaluate the results of telephone monitoring performed by the home attendant care unit on discharged patients during the ongoing pandemic. The research was carried out by analyzing the records of the home attendant care unit of the Presidency of Public Health Services of the Provincial Health Directorate of Kayseri.

Research universe, sample, study group

The study, conducted as retrospective, cross-sectional and descriptive, included patients with SARS-CoV-2 infection and they were discharged after hospital treatment in Kayseri province. Universe of the study is composed of 862 patients in Kayseri province, aged between 18 and 80, treated in hospital after having positive results of their Covid-19 Polymerase Chain Reaction (PCR) tests between 28.08.2020 and 16.09.2020, and reached by telephone after being discharged. 102 patients were excluded from research for the incompleteness of their data. Therefore, the study was completed with 760 patients.

Ethical Approval

For the study to be conducted, institutional authorization was obtained from the Provincial Health Directorate of Kayseri. Ethics committee approval was obtained from the Non-invasive Research Ethics Committee of Nuh Naci Yazgan University. (Approval No: 2020/14, Approval Date: 28.10.2020)

Data collection tool and gathering of data

Overall condition of discharged patients is learned and recorded in patient folders by making telephone calls, on the second and fourth days after discharge. In this study, these folders were examined, and recorded data was uploaded to the statistical program. Researchers collected data due to the examination of screening of folders.

Evaluation of data

Statistical evaluation of the study was conducted by using SPSS 22.0 (SPSS Inc., Chicago, IL) packaged software. Descriptive statistics were given as mean, standard deviation, median, minimum and maximum, while percentages were used for categorical data. Also, in order to determine intergroup differences in categorical variables, the Chi-Square test was used. Kolmogorov-Smirnov test was used to analyze the normal distribution of data.

Results

Of 760 patients whose files were analyzed in the study, 52.1% were male and 47.9% was female. The age median was 57 (18-96). 48.3% of the patients had one or more types of chronic diseases (Table 1). Among patients who were hospitalized and scanned with computerized thorax tomography, displayed images of 56.1% were interpreted as compatible with Covid-19 and 26,1% were diagnosed as compatible with viral pneumonia. 77.6% of patients underwent pneumonia, 0.9% stayed in intensive care and 0.7% of them were monitored under intubation due to Covid-19. 54.2% of patients did not receive medication at home after discharge (Table 1).

In phone calls after discharge, 66.8% of patients said that they felt good. 51.3% of them stated that there were no symptoms on the second day after their discharge, while on the fourth day this rate increased to %77.4. %3 of the patients called for help from 112 in the post-discharge period and 4.6% of them were rehospitalized (Table 1).

Table 1. Range of patients in age and chronic diseases and range of properties of Covid-19 disease in patients

	n	%
Gender		
Female	364	47.9
Male	396	52.1
Chronic Disease		
No chronic disease	393	51.7
Hypertension	75	9.9
Diabetes Mellitus	44	5.8
COPD-Asthma	41	5.4
Cardiac Failure	26	3.4
Liver Failure	2	0.3
More than one chronic disease	129	17.0
Other	50	6.6
CT in Hospitalization		
No CT	115	15.1
CT positive, compatible with Covid-19	426	56.1
CT positive, not compatible with Covid-19	55	7.2
Compatible with viral pneumonia	164	21.6
Diagnosis with pneumonia		
Pneumonia	590	77.6
No Pneumonia	170	22.4
Intensive care		
Stayed in intensive care	7	0.9
Not stayed in intensive care	753	99.1
Intubation		
Intubated	5	0.7
Not intubated	755	99.3
Continued medication		
Favipiravir	318	41.8
Hydroxychloroquine+Favipiravir	2	0.7
Hydroxychloroquine	15	2.0
No medication	412	54.2
Other	13	1.7
How well the patients feel after discharge		
Good	508	66.8
Medium	232	30.5
Poor	20	2.6
Symptoms on 2nd day after discharge		
Fever	7	0.9
Weakness-Tiredness	46	6.1
Coughing	82	10.8
Sore throat	6	0.8
Dyspnea	27	3.6
Pain in muscles and joints	18	2.4
Loss of smell and taste	21	2.8
Diarrhea	10	1.3
Multiple symptoms	123	16.2
No symptoms	390	51.3
Symptoms in 4th day after discharge		
Fever	2	0.3
Weakness-Tiredness	33	4.3
Coughing	35	4.6
Sore throat	3	1.5
Dyspnea	15	0.4
Pain in muscles and joints	11	1.5
Loss of smell and taste	4	0.5
Diarrhea	7	0.9
Multiple symptoms	44	5.8
No symptoms	588	77.4
Call for help from emergency service after discharge		
Called for help	23	3
Not called for help	737	97
Rehospitalization		
Rehospitalized	35	4.6
Not rehospitalized	725	95.4
Total	760	100

Age median of groups that stated their clinical condition good and medium was lower than the group of poor clinical condition (p: 0.001). The average hospital stay was 6 (1-19) days. The average median of hospital stays of females was 6 (1-18) days; it was 6 (1-19) days in males (p: 0.642). The median of hospital stays of patients that stated their clinical condition as good was 6 (1-18), in patients who stated their condition as medium was 6 (1-19), and in patients stated their condition as poor was 8 (1-15) days (p: 0.051). There was no meaningful difference between groups (p: 0.051).

Of the patients that stated their clinical condition as poor, 40% had multiple symptoms and 20% had dyspnea. Of the patients that stated their clinical condition as good, 26.2% had numerous symptoms and 6.2% had dyspnea. However, no statistical difference could be observed between these groups (p: 0.174). 45% of patients with poor clinical condition were rehospitalized and 35% of them was called in post-discharge period. 112 (p<0.001) (Table 2).

Frequency analysis was done. **COPD:** Chronic Obstructive Pulmonary Disease, **CT:** Computerized Tomography

Table 2. Evaluation of variables regarding clinical situation

		Clinical Condition			p-Value
		Good n(%)	Medium n(%)	Poor n(%)	
Age	Median (min-max)	56 (18-96) ^c	58(22-89) ^b	69(39-88) ^{b, c}	0.001
	Female	228 (44.9)	126(54.3)	10(50)	
Gender	Male	280 (55.1)	106(45.7)	10(50)	0.058
	Yes	3 (0.6)	2(0.9)	0(0)	
Intubation	No	505 (99.4)	230(99.1)	20(100)	0.854
	Yes	5 (1)	2(0.9)	0(0)	
Stay in Intensive Care	No	503 (99)	230(99.1)	20(100)	0.897
	Yes	385 (75.8)	189(81.5)	16(80)	
Pneumonia	No	123 (24.2)	43(18.5)	4(20)	0.221
	Yes	10 (2)	16(6.9)	9(45)	
Rehospitalization	No	498 (98)	216 (93.1)	11(55)	<0.001
	Yes	6 (1.2)	10 (4.3)	7(35)	
Emergency Service Call	No	502 (98.8)	222 (95.7)	13(65)	<0.001
	Total	508 (100)	232 (100)	20(100)	

Significant P value <0.05. Kruskal Wallis analysis and Dunn's correction were performed for the age parameter. The Chi-Square test was performed for other parameters. (a) There is a difference between good and medium groups. (b) There is a difference between medium and poor groups. (c) There is a difference between good and poor groups.

Regarding rehospitalization, there was no difference between genders (p: 0.338). The age median of rehospitalized patients was 66 (41-89), while the age median of others was 57 (18-96) (p<0.001). 2% of patients with good clinical condition, 6.9% of patients with medium clinical condition and 45% of poor clinical condition were rehospitalized (p<0.001). 6.4% of patients without chronic diseases were rehospitalized, while this rate was 2.7% (p: 0.017). The median of first hospital stays of patients with chronic diseases was 6 (1-19), the median of hospital stays of patients without chronic diseases was 5 (1-15) (p<0.001). 5.8% of patients who did not use the medication after discharge and 3.1% of patients who used Favipiravir after discharge were rehospitalized. There was a difference between groups (p: 0.008). There was no difference between patients with and without pneumonia during their first hospital stays, regarding rehospitalization (Table 3).

Table 3. Properties of rehospitalized patients

		Rehospitalization		Total	p-Value
		No (n%)	Yes (n%)		
Age	median(min-max)	57(18-96)	66(41-89)	508(100)	<0.001
Clinical Condition	Good	498 (98)	10 (2)	508(100)	<0.001
	Medium	216 (93.1)	16 (6.9)	232(100)	
	Poor	11 (55)	92 (45)	103(100)	
Chronic Disease	Yes	357(97.3)	10(2.7)	367(100)	0.017
	No	368(93.6)	25(6.4)	393(100)	
Post-Discharge Medication	Favipiravir	308 (96.9)	10 (3.1)	318(100)	0.008
	Hydroxychloroquine+Favipiravir	1 (50)	1(50)	2(50)	
	Hydroxychloroquine	15 (100)	0 (0)	15(100)	
	No	388 (94.2)	24 (5.8)	412(100)	
Pneumonia	Other	13 (100)	0(0)	13(100)	0.891
	No	470 (95.9)	15 (4.1)	485(100)	
	Yes	255 (95.4)	20 (4.6)	275(100)	

Significant P-value <0.05. Kruskal Wallis analysis and Dunn's correction were performed for the age parameter. Chi-Square test was performed for other parameters.

Discussion

Covid-19, which was declared as a pandemic, still has its effects on human health. Nowadays, while the number of patients and number of hospital applications greatly surge, the number of patients with poor medical condition and in need of intensive care has been increasing day by day. Nearly 15% of hospitalized Covid-19 patients need hospitalization and oxygen support due to dyspnea [7]. If patients' oxygen needs with less lack of oxygen could've been addressed at homes, hospital stays would not be needed [8]. On the other hand, continuous oxygen needs of patients has prolonged hospital stays. These circumstances result in prolonged usage of protective medical equipment, such as masks and protective clothing [9]. Moreover, healthcare providers are exposed to Covid-19 for extended periods. Protracted hospital stays resulting from Covid-19 also obstruct the hospitalization of non-Covid-19 patients [10].

Increased number of patients, recurrent outpatient submissions, prolonged length of hospital stay, and intensive care needs have got healthcare systems nearly to a standstill. New methods needed to be tried in order to lighten the burden. During the Covid-19 pandemic, monitoring patients in their homes became a novel and potent method [11,12].

In our post-discharge monitoring, patients were called by telephone on second and fourth days, asked for their overall conditions, proper use of medication and existence of newly-developed symptoms, especially dyspnea. They were also notified about the process of monitoring in homes and rules of isolation. We believe that a functioning home-monitoring system has great importance in disease monitoring, and this can be achieved with a proper organization. Annis et al. showed in their studies that post-discharge monitoring at homes for Covid-19 patients decreased the duration of hospital stays. They determined that home monitoring is reliable and positively affects patient satisfaction [7]. Health problems of patients staying in intensive care has continued for a longer time in post-discharge period [13]. However, in our study, no significant difference was observed between the patients staying in the intensive care unit and in their clinical status. The fact that we have a small number of patients staying in intensive care may be the reason for this situation.

The clinical condition of intubated patients is worse [14]. In our study, no significant difference was observed between the clinical conditions of intubated and non-intubated patients. The number of patients was low, and the patients included in the study were the individuals followed up at home, which may explain this situation.

It was demonstrated that patients hospitalized as a result of Covid-19, still had permanent symptoms, especially tiredness and dyspnea, even on the 110th day after their discharge. In another study, in which patients were followed up for 60 days after discharge, it was found that at least one symptom, especially fatigue and shortness of breath, persisted in 87% [15]. Secondary according to hospital stays and related stress, several conditions were also reported in patients, such as hair loss and generalized anxiety disorder. These results have demonstrated the long-term necessity for monitoring programs [16]. Although our study was shorter-term, we found that 48.7% of patients' symptoms didn't change and continued in post-discharge period. On second day, the main symptoms of the patients are cough, fatigue, and shortness of breath.

Many centers had to discharge their Covid-19 patients faster and new projects were produced to fulfill the post-discharge requirements. Patients with better overall condition and who are less dependent to the hospital needed to be discharged earlier. However, their discharges were delayed, because of waiting for PCR-negative results or the transmission risk to persons living together in the same address with patients-to-be-discharged. Quick circulation could not be ensured in hospital stays. Hotel rooms were used as a solution for this issue and patients were tried to be observed daily with the telemedicine method [17].

In the study we conducted, the overall conditions of patients were questioned with telemedicine method; patients with worse overall conditions were evaluated by teams that include doctors and, if needed, were quickly directed to 112 emergency system. As a result, hospital stays were provided for nearly half of the patients that stated their condition as poor.

In a study by Richards et al., the length of hospital stays, and mortality rates of Covid-19 patients showed parallelism to ages of patients. 53.7% of persons over the age of 80 were reported death being hospitalized [18]. Our study demonstrates that elderly patients in the post-discharge period feel themselves worse more frequently and their rehospitalization rates were higher. Therefore, we consider that patients over the age of 65 need to be monitored more regularly and their home visits by healthcare services must be more often than younger patients, if possible.

In a meta-analysis, it was shown that the rehospitalization rates of patients within one year were 10.34% [19]. In our study, the rehospitalization rate was found to be 4.6%. The fact that our study conducted early follow-up and did not analyze long-term data may have caused the rate to be low.

In conducted studies, it was observed that Covid-19 affected male patients more than females and their mortality rates were higher [20]. In our study, it was seen that gender rates of discharged patients were close; however, number of male patients in intensive care was higher.

Chronic diseases, such as hypertension, cardiovascular diseases, chronic kidney diseases and diabetes, exacerbate the disease [21]. In our study, the rehospitalization rates of patients with chronic diseases were meaningfully, although they had been hospitalized longer in their first stays.

Limitations

The symptoms mentioned are the detection of patients. The inability to perform a physical examination on the patients is a limitation of our study. Another limitation is the lack of long-term follow-up. Nevertheless, we think that our study is important in terms of being an example of the use of telemedicine.

Conclusion

Due to Covid-19, generalizing the use of medical service at homes, qualified nursing care at homes and providing rehabilitation services can prevent longer hospital stays and decrease transmission [22]. Also, it was stated that home attendant care units can be at a position of decision-making in regard to referral to hospitals [23,24]. In case of need, monitored patients were transferred to hospitals through ambulance. We consider that home attendant care units can contribute better to healthcare system in the forthcoming days, by providing post-acute support to Covid-19 patients.

Conflict of interest: None

Author Contributions		Author Initials
SCD	Study Conception and Design	AC, MBG,HA,ZKE
AD	Acquisition of Data	AC,ACÖ
AID	Analysis and Interpretation of Data	MBG, HA, ZKE
DM	Drafting of Manuscript	MBG, ZKE
CR	Critical Revision	AC, HA,ZKE,ACÖ

Financial support: None

Prior publication: The study has not been presented at any meeting before and was not published in any journal.

References

- Bogoch II, Watts A, Thomas-Bachli A, Huber C, Kraemer MUG, Khan K. Pneumonia of unknown etiology in Wuhan, China: potential for international spread via commercial air travel. *J Travel Med.* 2020;13;27(2):1-3. <https://doi.org/10.1093/jtm/taaa008>.
- Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol.* 2020;92(4):401-2. <https://doi.org/10.1002/jmv.25678>.
- Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. *J Infect.* 2020;80(6):e14-e18. <https://doi.org/10.1002/jmv.25678>.
- Avila-Funes JA, Helmer C, Amieva H, Barberger-Gateau P, Le Goff M, Ritchie K, et al. Frailty among community-dwelling elderly people in France: the three-city study. *J Gerontol A Biol Sci Med Sci.* 2008;63(10):1089-96. <https://doi.org/10.1093/gerona/63.10.1089>.
- Zhao S, Lin Q, Ran J, Musa SS, Yang G, Wang W, et al. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak. *Int J Infect Dis.* 2020;92:214-7. <https://doi.org/10.1016/j.ijid.2020.01.050>.
- Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;15;395(10223):497-506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
- Annis T, Pleasants S, Hultman G, Lindemann E, Thompson JA, Billecke S, et al. Rapid implementation of a COVID-19 remote patient monitoring program. *J Am Med Inform Assoc.* 2020;1;27(8):1326-30. <https://doi.org/10.1093/jamia/ocaa097>.
- Grutters LA, Majoor KI, Mattern ESK, Hardeman JA, van Swol CFP, Vorselaars ADM. Home telemonitoring makes early hospital discharge of COVID-19 patients possible. *J Am Med Inform Assoc.* 2020;1;27(11):1825-1827. <https://doi.org/10.1093/jamia/ocaa168>.
- Medina M, Babiuch C, Card M, Gavrilesu R, Zafirau W, Boose E, et al. Home monitoring for COVID-19. *Cleve Clin J Med.* 2020;27(11):1825-27. <https://doi.org/10.1093/jamia/ocaa168>.
- Watson AR, Wah R, Thamman R. The value of remote monitoring for the COVID-19 pandemic. *Telemed J E Health.* 2020;26(9):1110-1112. <https://doi.org/10.1089/tmj.2020.0134>.
- Meuwissen L, Bakker D de. CQ-index huisartsenzorg: meetinstrumentontwikkeling. Kwal van Zorg; 2008. <https://www.nivel.nl/sites/default/files/bestanden/CQ-index-huisartsenzorg-Meetinstrumentontwikkeling-v02-2008.pdf> Accessed: December 30, 2020.
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42(2):377-81. <https://doi.org/10.1016/j.jbi.2008.08.010>.
- Hui DS, Joynt GM, Wong KT, Gomersall CD, Li TS, Antonio G, et al. Impact of severe acute respiratory syndrome (SARS) on pulmonary function, functional capacity and quality of life in a cohort of survivors. *Thorax.* 2005;60(5):401-9. <https://doi.org/10.1136/thx.2004.030205>.
- Phillips MC, Sarff L, Banerjee J, Coffey C, Holtom P, Meurer S, et al. Effect of mortality from COVID-19 on inpatient outcomes. *J Med Virol.* 2022;94(1):318-26. <https://doi.org/10.1002/jmv.27332>.
- Carfi A, Bernabei R, Landi F; Gemelli Against COVID-19 Post-Acute Care Study Group. Persistent symptoms in patients after acute COVID-19. *JAMA.* 2020;324(6):603-5. <https://doi.org/10.1001/jama.2020.12603>.
- Halpin SJ, McIvor C, Whyatt G, Adams A, Harvey O, McLean L, et al. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation. *J Med Virol.* 2020;30. <https://doi.org/10.1002/jmv.26368>.
- 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](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: December 25, 2020.
- Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York city area. *JAMA.* 2020 May 26;323(20):2052-9. <https://doi.org/10.1001/jama.2020.6775>.
- Ramzi, Z. S. Hospital readmissions and post-discharge all-cause mortality in COVID-19 recovered patients; A systematic review and meta-analysis. *Am J Emerg Med.* 2022;51:267-79. <https://doi.org/10.1016/j.ajem.2021.10.059>.
- Coronavirus (COVID-19) deaths - our world in data. <https://ourworldindata.org/covid-deaths> Accessed: December 28, 2020.
- Wang X, Fang X, Cai Z, Wu X, Gao X, Min J, et al. Comorbid chronic diseases and acute organ injuries are strongly correlated with disease severity and mortality among COVID-19 patients: a systemic review and meta-analysis. *Research (Wash D C).* 2020 Apr 19;2020:2402961. <https://doi.org/10.34133/2020/2402961>.
- How will we care for coronavirus patients after they leave the hospital? By building post-acute care surge capacity. *Health Affairs.* <https://www.healthaffairs.org/doi/10.1377/hblog20200408.641535/full/> Accessed: December 28, 2020.
- Bowles KH, Ratcliffe SJ, Holmes JH, Keim S, Potashnik S, Flores E, et al. Using a decision support algorithm for referrals to post-acute care. *J Am Med Dir Assoc.* 2019;20(4):408-13. <https://doi.org/10.1016/j.jamda.2018.08.016>.
- Keim SK, Bowles KH. Comparison of algorithm advice for post-acute care referral to usual clinical decision-making: examination of 30-day acute healthcare utilization. *AMIA Annu Symp Proc.* 2018;6;2017:1051-9. <https://pubmed.ncbi.nlm.nih.gov/29854173/>