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Early View

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Home-monitoring reduces hospital stay of COVID-19 patients

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To the editor:

With great interest we read the article by Dirikgil et al. in which they demonstrate the potential of home-monitoring to reduce hospital admissions by safely surveying clinical symptoms and vitals [1]. They encourage to further consider strategies of home-monitoring in larger patient groups and particularly in patients with confirmed COVID-19.

In March 2020 COVID-19 led to a pandemic. In April 2020 we rapidly developed and implemented home-monitoring after hospital discharge in COVID-19 patients to reduce hospital stay [2]. During the COVID-19 pandemic, home-monitoring emerged as a new and powerful modality in several centres all around the world for various indications [1,3–6]. We would like to share our first-year experience with COVID-19 home-monitoring in the largest patient cohort to date (n=320).

We retrospectively report on our experience with home-monitoring for COVID-19 patients in the Netherlands. Patients hospitalised for COVID-19 with clinical improving trend and oxygen therapy tapered down to a maximum of 3 L/min, were approached for earlier discharge with home-monitoring. Home-monitoring consisted of twice daily control of oxygen saturation, temperature, and symptoms. Warnings for deterioration or comments were sent directly to the home-monitoring team of medical residents supervised by pulmonologists. The team contacted patients by phone to assist in titration of oxygen, control clinical symptoms, and advise presentation to the hospital or general practitioner. Incidentally the team gave advice on the use of antimicrobials, antitussives, or the use of inhalers. A more detailed method description is available in Grutters et al. 2020 [2]. Main outcomes were reducing length of hospitalisation, safety, defining risk factors for readmission, and patient satisfaction.

We included all COVID-19 patients discharged with home-monitoring from the St. Antonius Hospital between April 8, 2020 and May 17, 2021. We recorded demographic data, diagnostic method, admission at intensive care unit, oxygen therapy, fever at discharge, disease duration, length of hospitalisation, and underlying comorbidities [7]. Reduction in length of hospitalisation was the sum of days receiving oxygen therapy at home plus one day, comparable to the hospitals ward protocol in which patients were discharged one day after the oxygen was tapered down. A maximum of 14 days was noted. We recorded duration of monitoring and number of telephone contacts. Furthermore, patients completed a satisfaction questionnaire based on Consumer Quality Index in General Practice questionnaires [8]. The Medical research Ethics Committees United of the St.

Antonius Hospital approved this study (reference number W20.107 / Z20.065). Fisher's exact test for categorical data was used to define risk factors for readmission.

During the first year of home-monitoring we included 320 patients (64% male). Patient's characteristics are shown in Table 1. A total of 196 patients (61%) received oxygen therapy after discharge ranging from 1-3 L/min. Mean reduction is length of hospitalisation was 5.1 (±3.4) days, and for patients with oxygen therapy 6.4 (±3.2) days.

Reassessment at the emergency department was indicated in 39 (12%) patients. Readmission to the ward was necessary in 23 (7%) patients, which included 17 (74%) males and mean age 62 (±10) years. No fatalities occurred. Main reasons for readmission were hypoxemia (n=15) and pulmonary embolism (n=5). Underlying comorbidities in readmitted patients were chronic heart disease (n=11; 48%), chronic lung disease (n=11; 48%), hypertension (n=10; 43%), diabetes mellitus (n=4; 17%), obesity (n=3; 13%), fever at time of discharge (n=2; 9%), and immunocompromised state (n=1; 4%). Sixteen (70%) readmitted patients used oxygen at home, which was not a risk factor ($p = 0.51$). Chronic heart disease ($p = 0.00$) and obesity ($p = 0.02$) were risk factors for readmission. The other reported underlying comorbidities and fever at time of discharge were not identified as significant risk factors.

Home-monitoring was rated user-friendly by 93%. It took 73% less than 10 minutes daily to take the measurements and fill in the app. In respectively 14% and 83% of cases it was mostly or always clear what to do when low oxygen saturation was measured. Ninety-eight percent would recommend home-monitoring to acquaintances. The limitation of our study is the absence of a control group, therefore it is difficult to draw conclusions regarding the generalisability of our outcomes.

In summary, while Dirikgil et al. focused on a monitoring programme of suspected COVID-19 patients presenting to the emergency department, we focus on home-monitoring of severe COVID-19 patients after discharge from the hospital. In addition to Dirikgil et al. who showed home-monitoring reduced short stay admissions, we confirm home-monitoring reduces hospital stay of hospitalised COVID-19 patients in the largest patient cohort to date. This increases capacity for regular health care. Compared to our pilot project (n=33) we confirm the average reduction is hospitalisation of 5.1 (±3.4) days [2]. Our readmission rate of 7% is comparable to 9% reported by Dirikgil et al. and 12% reported by Van Herwerden et al. [1,5]. Chronic heart disease and obesity were risk factors for readmission. In our cohort fever at discharge was not a risk factor for readmission in contrast to Van Herwerden et al. ($p = 0.01$) [5]. Another important confirmation is the high patient satisfaction which is comparable to the literature. This highlights that home-monitoring positively contributes to patient's health.

To conclude, we confirm that home-monitoring reduces hospital stay of COVID-19 patients in the largest patient cohort to date.

Table 1 Patient characteristics of our COVID-19 home-monitoring cohort (n=320)

	Total cohort (n=320)	Readmitted patients (n=23)
Gender, n (%)		
Male	206 (64)	17 (74)
Age, mean years (±SD)	56 (12)	62 (10)
COVID-19 diagnosis based on, n (%)		
Polymerase Chain Reaction	318 (99)	23 (100)
Computed Tomography	1 (0.3)	0
Chest X-ray	1 (0.3)	0
Underlying comorbidities, n (%)		
Diabetes mellitus	39 (12)	4 (17)
Hypertension	89 (28)	10 (43)
Obesity (Body Mass Index over 30)	100 (31)	3 (13)
Chronic pulmonary disease	90 (28)	11 (48)
Chronic heart disease	54 (17)	11 (48)
Immunocompromised state	10 (3)	1 (4)
Admission to the Intensive Care Unit, n (%)	54 (17)	1 (4)

Length of stay on Intensive Care Unit, mean days (±SD)	9 (8.5)	5
Oxygen therapy during hospitalisation, n (%)		
Nasal oxygen or Non-Rebreather Mask	260 (82)	21 (91)
Non-Invasive Ventilation or Nasal High Flow Oxygen Therapy	45 (14)	2 (9)
Intubation	11 (3.4)	0
Duration of disease on admission to home-monitoring, mean days (±SD)	18 (9.1)	15.6 (10.5)
Length of hospitalisation, mean days (±SD)	8.6 (6.6)	6.8 (5.2)
Fever at time of discharge, n (%)	7 (2)	2 (9)
Oxygen therapy when discharged, n (%)		
Yes	196 (61)	16 (70)
No	124 (39)	7 (30)
Total reduction in length of hospitalisation, days		
In need for oxygen therapy, *n = 189**	1200	
No need for oxygen therapy, *n = 76***	141.5	
Average reduction in length of stay, mean days (±SD), *n=265*	5.1 (3.4)	
Length of home-monitoring, mean days (±SD)	11.7 (5.4)	
Amount of telephone contact, mean number (±SD)	5.7 (3.0)	

** Seven patients were excluded due to re-admission or follow up in another hospital. ** In 31 patients no reduction in length of stay was noted, in 17 patients no reduction in length of stay was expected.*

Normally distributed data were presented as mean and standard deviation (±SD). Categorical data were presented as number and percentage.

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