CORRESPONDENCE

Pulse Oximetry for Monitoring Patients with Covid-19 at Home — A Pragmatic, Randomized Trial

TO THE EDITOR: Reports of silent hypoxia in patients with coronavirus disease 2019 (Covid-19) have raised the question of whether patients should use pulse oximeters at home to measure oxygen saturation rather than relying on subjective dyspnea as an indicator of clinical deterioration.[1,2] Many Covid-19 remote-monitoring programs include home pulse oximetry,[3,4] but the effectiveness of these programs remains unknown. We report the findings from a randomized trial that assessed a text message–based remote-monitoring program (COVID Watch) supplemented with monitoring of oxygen saturation by means of a home pulse oximeter (ClinicalTrials.gov number, NCT04581863).

As part of routine care in our six-hospital health system (which includes more than 500 outpatient practices), adults in our electronic health record with Covid-19 infection — as determined by their clinician or a confirmed positive test for Covid-19 — are enrolled in COVID Watch, a 2-week program involving twice-daily automated text messages inquiring about dyspnea and offering rapid callbacks from nurses when appropriate. This program has been associated with improved survival as compared with no remote monitoring.[5]

From November 29, 2020, to February 5, 2021, we randomly assigned in a 1:1 ratio patients who were enrolled in COVID Watch to participate in the standard monitoring program in addition to home pulse oximetry or the standard program alone. Patients in the pulse oximetry group were provided a pulse oximeter and were monitored for subjective symptoms or a low or declining oxygen saturation. Ethical considerations precluded assigning patients to no monitoring as a control. The prespecified primary outcome was the number of days the patient was alive and out of the hospital at 30 days, assessed in patients with test-confirmed Covid-19. Exploratory outcomes included patient-reported anxiety levels, use of health care services, and death at 30 days. Details regarding the patients and the trial methods are provided in the Supplementary Appendix, available with the full text of this letter at NEJM.org; the trial protocol is also available at NEJM.org.

A total of 1041 patients (606 of whom had test-confirmed Covid-19) were assigned to the standard program group, and 1056 patients (611 of whom had test-confirmed Covid-19) were assigned to the pulse oximetry group. Among patients in the pulse oximetry group, 77.7% submitted at least one pulse oximetry reading; these patients submitted a mean (±SD) of 9.8±8.5 readings, corresponding to a response rate of 69.4±32.8% to pulse oximetry check-ins.

Among patients with test-confirmed Covid-19, there was no significant between-group difference in the number of days they were alive and out of the hospital at 30 days (mean, 29.4 days in the pulse oximetry group and 29.5 days in the standard program group; P=0.58; difference, −0.1 days; 95% confidence interval [CI], −0.4 to 0.2) (Table 1). Prespecified subgroup analyses that were specifically powered to detect a difference in the number of days patients were alive and out of the hospital among Black patients as compared with non-Hispanic White patients showed no significant difference in this outcome. The mean number of telephone encounters within the health system (an exploratory outcome) was 3.3±4.2 in the pulse oximetry group and 2.4±3.3 in the standard program group (difference, 0.9; 95% CI, 0.4 to 1.3).

Among patients with Covid-19, the addition of home pulse oximetry to remote monitoring

Table 1. Primary and Key Exploratory Outcomes among Patients with Covid-19 within 30 Days after Enrollment (Intention-to-Treat Population).*

Outcome	Standard Program + Pulse Oximetry (N = 611)	Standard Program (N = 606)	Difference (95% CI)†	P Value
Primary outcome				
Days alive and out of the hospital	29.4±2.8	29.5±2.3	–0.1 (–0.4 to 0.2)	0.58
Exploratory outcomes				
Anxiety level‡				
Day of enrollment	2.8±1.3	2.9±1.3	–0.1 (–0.3 to 0.1)	
Day 7	2.3±1.3	2.3±1.3	0.0 (–0.2 to 0.3)	
Day 14	2.0±1.3	2.0±1.2	0.0 (–0.3 to 0.4)	
Emergency department encounter — no. of patients (%)	57 (9.3)	68 (11.2)	–1.9 (–5.3 to 1.5)§	
Within health system — no. of patients/total no. (%)	56/57 (98.2)	67/68 (98.5)	–0.3 (–23.9 to 23.3)§	
Days from enrollment to encounter	9.2±6.9	8.8±7.3	0.4 (–2.1 to 3.0)	
Lowest recorded systolic blood pressure — mm Hg¶	121.5±15.7	121.3±14.8	0.2 (–5.3 to 5.7)	
Lowest recorded oxygen saturation — %¶	93.7±5.1	94.2±11.8	–0.5 (–3.7 to 2.7)	
Supplemental oxygen provided — no. of patients/total no. (%)¶	14/56 (25.0)	11/67 (16.4)	8.6 (–6.6 to 23.8)§	
Maximum temperature — °F¶	99.1±1.1	98.7±1.2	0.4 (–0.1 to 0.8)	
Hospitalization — no. of patients/total no. (%)	43/611 (7.0)	41/606 (6.8)	0.2 (–2.6 to 3.2)§	
Within health system	39/43 (90.7)	41/41 (100.0)	–9.3 (–39.9 to 21.3)§	
Intubation and ventilator support provided¶	4/39 (10.3)	1/41 (2.4)	7.8 (–3.1 to 18.8)§	
Death — no. (%)	5 (0.8)	3 (0.5)	0.3 (–0.7 to 1.5)§	
Health-system encounter — no. per patient¶‖				
Office visit	0.2±0.6	0.2±0.5	0.0 (–0.1 to 0.1)	
Telemedicine	0.5±0.9	0.5±0.9	0.0 (–0.1 to 0.1)	
Telephone	3.3±4.2	2.4±3.3	0.9 (0.4 to 1.3)	

* Plus–minus values are means ±SD. Patients with test-confirmed coronavirus disease 2019 (Covid-19) who were enrolled in the COVID Watch remote-monitoring program were randomly assigned to receive the standard monitoring program or the program supplemented with home monitoring of oxygen saturation with the use of a pulse oximeter. Unless otherwise noted, data are shown for patients who presented to a hospital within the health system or to any of 53 hospitals outside the health system and whose data were captured in the regional health information exchange.

† The confidence intervals have not been adjusted for multiplicity and cannot be used to infer treatment effects for outcomes other than the primary outcome.

‡ Anxiety was reported by patients in response to the question "In the past 24 hours, how worried have you been about your COVID symptoms?" and was assessed on a scale of 1 to 5, with 1 indicating "not at all worried" and 5 indicating "very worried." The anxiety survey question was adapted from previously validated instruments and modified for this trial and pilot tested for clarity and understanding (see the Supplementary Appendix at NEJM.org for complete patient-reported outcome data sets and associated references). The survey was administered by means of text messaging on the day of enrollment and on days 7 and 14 after enrollment.

§ The value is the difference in percentage points.

¶ Data are excluded for patients who presented to any of 53 hospitals outside the health system.

‖ Initial callbacks to patients who triggered an escalation during the trial were recorded as telephone encounters in the electronic health record. Patients were subsequently referred for telemedicine visits if indicated on the basis of initial triage with the use of the clinical management protocols of the program. Telemedicine visits were documented visits between a licensed prescriber (advanced practice practitioner or physician) and patient, typically with the use of videoconference technology. Telephone calls and telemedicine visits are mutually exclusive. These measures are inclusive of all encounters within the health system, not solely within the COVID Watch program.

did not result in a greater number of days alive and out of the hospital than subjective assessments of dyspnea alone.

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