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IMAGING VIGNETTE

INTERMEDIATE

CLINICAL VIGNETTE

Remote Monitoring of Respiratory Pattern in an ICD Patient With COVID-19 Pneumonia

Giovanni Malanchini, MD,[a] Maurizio Malacrida, MSc,[b] Paola Ferrari, MD,[a] Michele Senni, MD,[c] Paolo De Filippo, MD[a]

ABSTRACT

A 67-year-old man with history of heart failure developed dyspnea. In this report, we describe an increase in his device-detected respiratory rate. Monitoring respiratory rate is recommended for evaluating acute cardiac decompensation, but such an algorithm could also be used to diagnose episodes of pneumonia caused by severe acute respiratory syndrome-coronavirus-2 infection. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2021;3:1007–9) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Implantable devices, including implantable cardioverter-defibrillators (ICDs), cardiac resynchronization therapy (CRT), and pacemakers (PPMs), enable continuous measurement of clinical variables and access to patients' data via remote monitoring systems. It remains unclear whether such technologies could provide useful insights into coronavirus disease-2019 (COVID-19)–related infections because no clinical experience has yet been reported.

We report the case of a patient who tested positive for severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection and who was implanted with an ICD (AUTOGEN X4 cardiac resynchronization therapy defibrillator; Boston Scientific, St. Paul, Minnesota) equipped with respiratory rate trend (RRT), a diagnostic algorithm for continuous respiratory rate (RR) monitoring and followed-up with the LATITUDE (Boston Scientific) remote monitoring system.

A 67-year-old man with a history of hypertension, diabetes, permanent atrial fibrillation, and myocardial infarction developed signs and symptoms of COVID-19 and was admitted to the hospital in March 2020.

From the [a]Cardiac Electrophysiology and Pacing Unit, ASST Papa Giovanni XXIII, Bergamo, Italy; [b]Boston Scientific Italia, Milan, Italy; and the [c]Cardiology Unit, ASST Papa Giovanni XXIII, Bergamo, Italy.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. M. Malacrida is Boston Scientific employee. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

CRT = cardiac resynchronization therapy

COVID-19 = coronavirus disease-2019

ICD = implantable cardioverter-defibrillator

PPM = pacemaker

RR = respiratory rate

RRT = respiratory rate trend

SARS-CoV-2 = severe acute respiratory syndrome-coronavirus-2

He was treated with acetaminophen, azithromycin, hydroxychloroquine, and oxygen supplementation with a nasal cannula and a Venturi mask. His symptoms began to resolve in the second week of the hospital stay, and he was discharged on April 11.

As depicted in **Figure 1**, there was an increase in the device-detected RR from an average of 17 respirations/min recorded on the first day of symptom onset to a peak of 22 respirations/min, recorded 2 to 3 days after admission. RRT continued to show values higher than average during the recovery phase, whereas the patient continued to receive oxygen, and RRT reached its nadir before discharge.

Cardiovascular diseases are dynamic entities, but they may have acute manifestations for which it is common to require urgent evaluation and intervention. Because COVID-19 has forced cardiologists to minimize in-person clinic visits and defer interventions, physicians are asked to make new decisions regarding new urgencies in a new setting (1). Device-based continuous monitoring of a patient's derived parameters could be helpful for diagnostic and prognostic evaluation of clinical conditions after device implantation, thereby potentially improving the remote clinical management of patients with cardiac devices (e.g., ICDs, CRT, or PPMs), especially during the ongoing pandemic.

Recent reports have highlighted the substantial decrease in activity level recorded through continuous monitoring of cardiac devices as an important phenomenon during the COVID-19 pandemic (2). In the past decade, cardiac devices capable of measuring the RRT have been developed. In the MultiSENSE (Multisensor Chronic Evaluation in Ambulatory Heart Failure Patients) study, the novel HeartLogic algorithm for heart failure monitoring (Boston Scientific), which combines data from multiple device-based sensors and includes RRT function, was implemented. Notably, this index proved to be a sensitive and timely predictor of impending heart failure decompensation (3). Although monitoring RR is recommended by international guidelines primarily for evaluating acute decompensation, such an algorithm could also be useful to evaluate episodes of a sudden increase in RR, a potential sign of respiratory illness, such as pneumonia caused by SARS-CoV-2 infection.

The case provided a first step in elucidating how data derived from continuous and remote monitoring of relevant variables could help an uneventful situation; we reported a potential new application for the detection of possible new COVID-19 infections.

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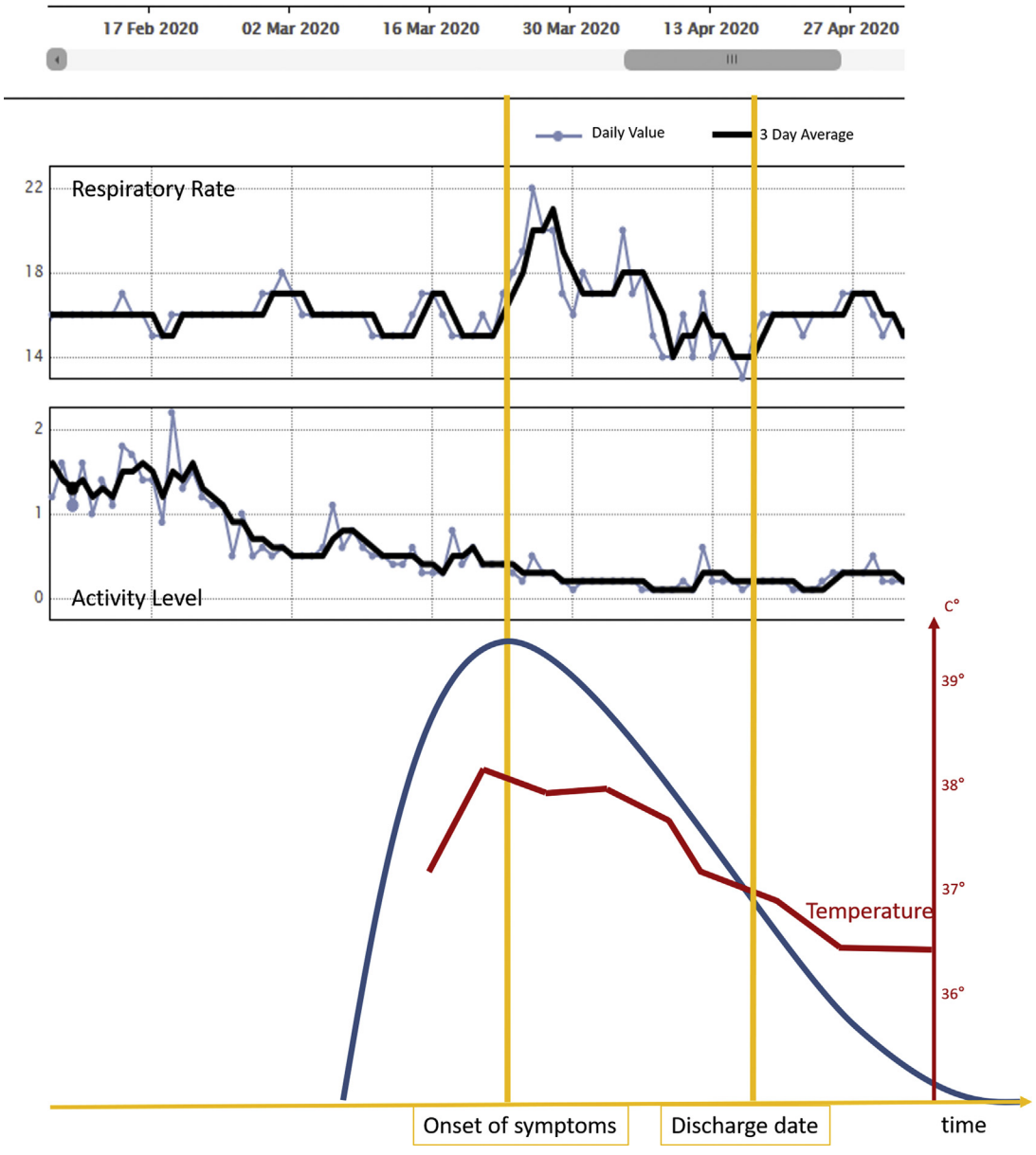
M. Malacrida is an employee of Boston Scientific. The other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Dr. Giovanni Malanchini, Cardiac Electrophysiology and Pacing Unit, ASST Papa Giovanni XXIII, Bergamo, Italy. E-mail: gmalanchini@asst-pg23.it.

FIGURE 1 Clinical Course of Coronavirus Disease-19 Symptoms and Clinically Relevant Parameters, Together With Device-Detected Respiratory Rate Trend in a Patient With an Implantable Cardioverter Defibrillator



The x axis represents time. **(Top)** Respiratory rate variations. **(Middle)** Daily activity level is plotted. The **yellow lines** represent days of symptom onset and hospital discharge. **(Bottom)** Super-imposed **red lines** refer to daily temperature as extracted from patient's medical record.

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