Reorganizing the device clinic: remote monitoring of cardiac implantable electronic devices during the COVID-19 pandemic

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Abstract

COVID-19 pandemic has caused a necessary reorganization of the elective outpatient device clinic. Remote monitoring (RM) of cardiac implantable electronic devices (CIEDs) has been validated as a safe and effective tool to follow patients, limiting the need for in-person visits. We provided a snapshot of the current clinical practice in a tertiary electrophysiology center in Italy, suggesting a potential model of care for patients with CIEDs. Before the COVID-19 pandemic, patients with implantable cardioverter defibrillators/cardiac resynchronization therapy (ICD/CRTs) were evaluated in the device clinic twice a year and patients with pacemakers (PMs) once a year; loop recorder (ILR) patients were followed remotely only. In the COVID-19 period RM was implemented for all compatible CIEDs. Patients with RM were not seen in clinic anymore and were followed with RM. In the COVID-19 period, 100% of newly implanted devices received RM (82 ILR, 194 PMs, 80 ICDs/CRTs), compared to 68% in the same months of 2019 (106/106 ILR, 83/203 PMs, 78/82 ICD/CRTs), $p<0.01$. Moreover, 502 previously implanted patients with RM compatible devices were contacted and received RM. By the end of February 2021, 1676 patients were remotely monitored at our Institution, with a potential saving of outpatient visits of 1683 visits/year, against an average of 8514 RM transmissions/year needing evaluation. RM of CIEDs is essential to reduce in-person visits during the COVID-19 pandemic. The potential for elective outpatient appointments reduction has to be counterbalanced by the sustainability of a large number of transmissions and data to analyze.

Title Page

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All Authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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Unstructured Abstract

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We provided a snapshot of the current clinical practice in a tertiary electrophysiology center in Italy, suggesting a potential model of care for patients with CIEDs.

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In the COVID-19 period, 100% of newly implanted devices received RM (82 ILR, 194 PMs, 80 ICDs/CRTs), compared to 68% in the same months of 2019 (106/106 ILR, 83/203 PMs, 78/82 ICD/CRTs), $p<0.01$. Moreover, 502 previously implanted patients with RM compatible devices were contacted and received RM. By the end of February 2021, 1676 patients were remotely monitored at our Institution, with a potential saving of outpatient visits of 1683 visits/year, against an average of 8514 RM transmissions/year needing evaluation.

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Key Words: COVID-19, Remote monitoring, Cardiac implantable electronic devices, Device clinic, Cardiac pacing

Abbreviations

CIEDs: Cardiac implantable electronic devices

COVID-19: Coronavirus Disease 19

CRT: Cardiac resynchronization therapy

EP: Electrophysiology

ICD: Implantable cardioverter defibrillator

ILR: Implantable loop recorder

PM: Pacemaker

RM: Remote monitoring

Brief Communication

Introduction

Coronavirus Disease 19 (COVID-19) has caused a necessary reorganization of the elective outpatient device clinic, highly impacted by the pandemic because of the usual need for multiple follow-up appointments.

Remote monitoring (RM) of cardiac implantable electronic devices (CIEDs) has already been validated as a safe and effective tool to follow patients, limiting the need for in-person visits[1].

Aim of our study was to provide a snapshot of the current clinical practice in a tertiary electrophysiology (EP) center in Italy and suggesting a potential model of care for patients with CIEDs in an era of limited access to hospital facilities.

Methods and Results

Before the COVID-19 pandemic, only patients implanted with a loop recorder (ILR) and patients implanted with an implantable cardioverter defibrillator (ICD) or a cardiac resynchronization therapy (CRT) device were given the possibility to have default RM. Conversely, only a minority of patients implanted with a pacemaker (PM) were on RM. Historically, patients with ICDs and CRTs were evaluated in our device clinic twice a year and patients with PMs once a year, whether or not they had a RM system at home. Conversely, ILR patients were followed exclusively with RM without routine in-person visits.

During the COVID-19 pandemic (March 2020-February 2021) the strategy of our center was to implement RM for all compatible CIEDs, in order to reduce in-person visits. Patients already in possession of a RM system were not seen in the device clinic anymore and were followed exclusively from home. During the study period, 100% of newly implanted devices received RM at the time of the implantation procedure: 82 ILR, 194 PMs, 80 ICDs/CRTs. This was a significant increase compared to the same months of 2019, when only 68% of patients received RM at the time of device implantation (106/106 ILR, 83/203 PMs, 78/82 ICD/CRTs; $p<0.01$). In addition, 502 patients implanted before March 2020 with RM compatible devices and not in possession of a RM system were contacted to receive the transmitter. A specific pathway was created to limit patient-to-patient interaction. A dedicated EP nurse contacted the patients by phone to perform an interview to screen for signs and symptoms of possible COVID-19 infection. If negative, the patient was scheduled to present to the device clinic to sign the RM consent form. Appointment slots were 30 minutes apart to avoid patients' interaction. Upon arrival in clinic, body temperature was measured, and a health screening form was filled and registered. The device was checked by an electrophysiologist only if the patient was due for his usual follow-up appointment (12 months since the prior follow-up for PMs, 6 months for ICDs/CRTs). For selected device types having the RM function programmed as ON by default, the RM monitoring transmitter was just handed over to the patient or mailed at home the following day and the patient was able to activate the system and initiate a transmission on his own or with the help of the technical support over the phone. For a minority of patients, the device-RM transmitter coupling was performed in-office. Scheduled transmissions were then organized every 3 months. In case of symptom onset (tachycardia, dizziness, syncope, chest pain, etc.), the patients were instructed to send an urgent manual transmission and contact the device clinic. None of the patients with RM was routinely seen in clinic anymore, not even at the time of the alleged 6-month or 12-month appointment. By the end of February 2021, a total of 1676 patients have been remotely monitored at our Institution. This greatly reduced semiannual and annual in-person visits (potential saving of 1683 visits/year), which translates into a significant reduction in patients' potential exposure to COVID-19.

Discussion

From the safety point of view, similar survival rates and safety outcomes have been demonstrated when RM was compared to in-person follow-up appointments in randomized clinical trials and metanalysis[2-5]. Moreover, it is well known that RM allows a prompt and quicker detection of arrhythmias and device malfunctions[5]. During the study period, we observed 213 clinical events that triggered an urgent manual transmission and/or required physician's intervention (table 1), successfully resolved over the following 24 h. None of the 1676 patients presented to the emergency room with a problem that went unnoticed by the RM system. However, the safe profile of RM had to be balanced against the high number of transmissions that our dedicated team received and that required daily evaluation (8514 RM transmissions/year).

Conclusion

In conclusion, RM of CIEDs, greatly increased in the past year, has become an essential tool to reduce in-person visits during the COVID-19 pandemic, and has shown to be safe and effective. The potential for elective outpatient appointments reduction has to be counterbalanced by the sustainability of a large number of transmissions and data to analyze.

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Table 1: Clinical events detected on RM

Clinical Event	n (%)
De novo atrial fibrillation / atrial fibrillation with rapid ventricular rate	91 (5.4%)
Ventricular tachycardia	39 (2.3%)
Antitachycardia pacing and/or shocks	24 (1.4%)
Inappropriate shocks	6 (0.3%)
Low battery voltage or elective replacement indication	19 (1.1%)
Device / Lead anomalies	13 (0.8%)
Significant pause / conduction system disease requiring PM implantation	21 (1.2%)