

RESEARCH LETTER

Remote Monitoring of Arrhythmias in the COVID Lockdown Era

A Multicentre Experience

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Cardiology societies have recommended increased use of remote monitoring (RM) technologies for diagnosis and follow-up of patients with arrhythmia during the coronavirus disease 2019 (COVID-19) pandemic.¹ Social distancing measures and lack of contact with device services may affect patient reports of arrhythmic symptoms, due to increasing social isolation and psychological stress. Furthermore, COVID infection may exacerbate arrhythmias in susceptible patients.² There is currently little known on the impact of the pandemic on symptom burden of arrhythmia patients; we aimed to evaluate changes in RM usage during the COVID pandemic and subsequent lockdown in the United Kingdom.

Institutional research board approval was obtained. We reviewed all actionable RM downloads from Medtronic Reveal XT, DX, and Linq implantable loop recorders (ILRs) between January 1, 2019 and April 30, 2020 across 4 hospitals in South London, United Kingdom (Kings College Hospital, Princess Royal University Hospital, St George's Hospital, and Croydon University Hospital), serving a combined population of 2.5 million. The data that support the findings of this study are available from the corresponding author upon reasonable request. Scheduled transmissions triggered by the Reveal Activator and manual unscheduled CareLink transmissions were treated as patient-initiated downloads. All other transmissions were device-initiated; arrhythmia auto-detect algorithms were configured consistently as per manufacturer recommended values. EGMs (where available) associated with all events were reviewed by 2 specialist physiologists and the cardiac rhythm identified.

The period under study was divided into 3 eras: before the first UK transmission of COVID was reported on February 27 was considered pre-COVID; from February 27 to March 22 was the era of social distancing, and March 23, marked the beginning of lockdown. We used 1-way ANOVA with Dunnett T3 multiple comparison test to examine for statistical significance between mean weekly download rates in the 3 eras. For analysis of individual logged events, we grouped these by month and compared COVID (distancing and lockdown combined) with pre-COVID, using 2-way ANOVA and Sidak multiple comparisons test. Number of downloads and events were expressed as *n* per week per ILR, that is, corrected for the number of ILRs under RM for that week of monitoring.

The study cohort comprised 1098 patients followed by RM. Over 16 months, there were 875 actionable downloads including 908 events from 409 patients; 788 events were autodetected or symptomatic arrhythmias; and 120 were related to device housekeeping. For each hospital, actionable downloads increased significantly during social distancing compared with pre-COVID and again after lockdown (Figure [A]). Relative to the pre-COVID era, there was a 3-fold increase in download rate during social distancing (from 0.007 ± 0.004 to 0.019 ± 0.004 downloads per ILR per week; $P=0.0016$) and a >7-fold increase during lockdown (0.050 ± 0.007 downloads per ILR per week; $P=0.0078$).

Analysis of logged events showed that total patient-initiated events increased during COVID (distancing and lockdown combined) from 0.006 ± 0.004 to 0.187 ± 0.012

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Nonstandard Abbreviations and Acronyms

COVID-19	coronavirus disease 2019
ILR	implantable loop recorder
RM	remote monitoring

events per ILR per week ($P < 0.0001$), but this was largely driven by events not showing arrhythmia; the specificity of patient-initiated events for arrhythmia declined from 15.2% to 12.7%. Total device-initiated events also increased from 0.001 ± 0.001 to 0.011 ± 0.007 events per ILR per week ($P < 0.0001$) and their specificity for verified arrhythmia decreased (from 65.4% to 55.0%). True arrhythmic episodes increased 5-fold during COVID ($P < 0.0001$) with the most common arrhythmias being atrial fibrillation (88 episodes), narrow complex tachycardias (52 episodes), and simple ventricular ectopy (30 episodes). No sustained ventricular arrhythmia was seen.

Our analysis shows that in an unselected patient population with ILRs, the early phase of the COVID pandemic was associated with a dramatic rise in actionable RM downloads, driven predominantly by an increase in patient-initiated events not associated with proven arrhythmias. Genuine arrhythmias also increased during COVID, and these were detected both by patient-initiated use of the RM equipment, and also via device algorithmic detection of arrhythmia. The mechanisms underlying increased patient interaction with RM equipment during the pandemic are likely complex and may include increased health anxieties and decreased distractions such as travel, employment and social activities. There has long been concern that COVID may confer arrhythmic risk, and our finding of increased arrhythmia detection in a nonhospitalized population during the pandemic supports these concerns. However, our data does not implicate COVID infection

directly as the cause of these arrhythmias, and other factors such as increased sedentariness, increased alcohol consumption, and increased stress may have played a part in increasing genuine arrhythmia burden.

Aside from any clinical consequences for individual patients, our findings have important workload implications; significant changes to RM workflows may be needed to accommodate expansion of this powerful diagnostic tool during and after the COVID pandemic.

ARTICLE INFORMATION

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Disclosures

F. Murgatroyd serves on advisory boards and steering committees for Medtronic Ltd; P.A. Scott serves on advisory boards for Medtronic Ltd. The other authors report no conflicts.

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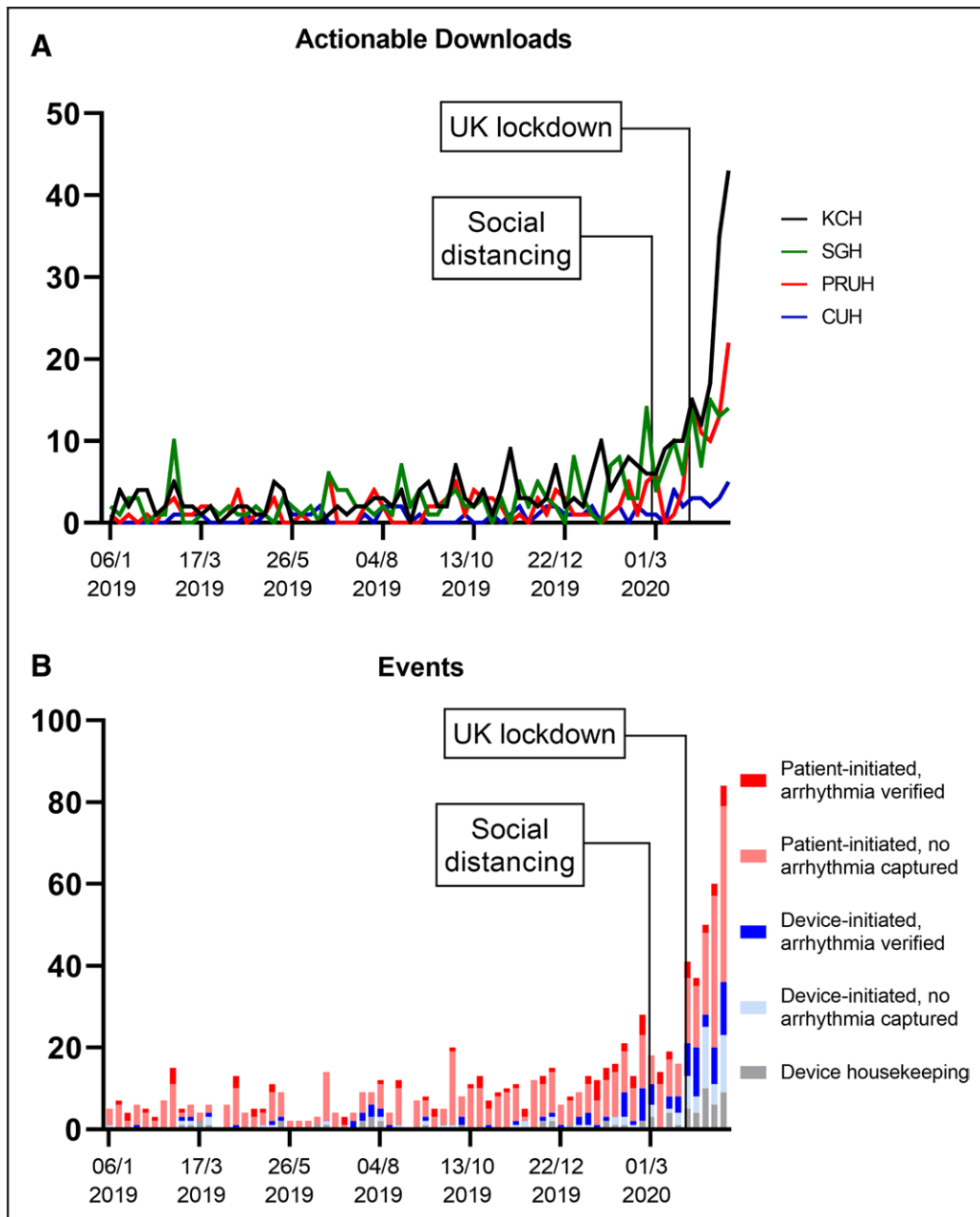


Figure. Trends in implantable loop recorder (ILR) usage over time before and during the early UK coronavirus (COVID) epidemic. **A**, Number of ILR remote monitoring (RM) downloads per week from January 1, 2019 to April 30, 2020 in four London hospitals. ILR downloads increased significantly above pre-COVID levels after the start of the UK COVID epidemic and again during lockdown. **B**, Number of ILR RM events per week in four London hospitals. Events are grouped by type based on physiologist review of associated EGMs. A rise in downloads during the epidemic related predominantly to increased patient-initiated events without documented arrhythmia. Confirmed arrhythmia events also increased moderately. CUH indicates Croydon University Hospital, London, United Kingdom; KCH, Kings College Hospital, London, United Kingdom; PRUH, Princess Royal University Hospital, London, United Kingdom; and SGH, St George’s Hospital, London, United Kingdom.