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Inpatient Use of Ambulatory Telemetry Monitors for COVID-19 Patients Treated with Hydroxychloroquine and/or Azithromycin

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AF=Atrial fibrillation; AZM=Azithromycin; COVID-19=Coronavirus 2019; ECG=Electrocardiogram; HCP=Healthcare provider; HCQ=Hydroxychloroquine; MCOT=Mobile cardiac outpatient telemetry; PPE=Personal protective equipment; QTc=Corrected QT

Coronavirus 2019 (COVID-19) has led to a rapid increase in hospital admissions, placing stress on healthcare systems that have a finite number of hospital beds, healthcare providers (HCPs), and medical supplies. Preliminary data suggest that hydroxychloroquine (HCQ) and azithromycin (AZM) may improve the clinical course in patients with COVID-19. (1,2) However, HCQ±AZM may increase the risk for arrhythmias and sudden cardiac death due to QT prolongation. (3,4) Given the widespread use of HCQ±AZM, it is challenging to monitor all of these inpatients on telemetry. Performing serial electrocardiograms (ECGs) for QTc monitoring increases HCP exposures and personal protective equipment (PPE) use.

We placed Mobile Cardiac Outpatient Telemetry (MCOT) (BioTelemetry, Malvern, PA, USA) on patients receiving HCQ±AZM for COVID-19 on non-telemetry floors. Following a baseline ECG, subsequent ECGs were cancelled. Telemetry technicians applied the MCOTs and linked them to the device phone. Patients had bidaily QTc measurements while receiving HCQ±AZM. An electrophysiologist received "urgent alerts" and bidaily reports from BioTelemetry. A QTc>500ms and any arrhythmias generated "urgent alerts." If a patient was discharged to complete HCQ±AZM as an outpatient or remained hospitalized after completing HCQ±AZM, the MCOT was removed, sterilized, and reused.

In one week, 117 consecutive COVID-19-positive patients on HCQ±AZM without telemetry monitors received an MCOT. The average age was 60.2±14.9 years (range 27-93 years); 40.5% were female, 52.1% had hypertension, 28.2% had diabetes, 0.9% had heart failure, and 5.1% had coronary artery disease. All patients were treated with HCQ 400mg bidaily for one day followed by 200mg bidaily for four days. Fifty-one (43.6%) patients also received ≥1 doses of intravenous azithromycin 500mg. Forty (34.2%) patients also received ≥1 other QT prolonging medications. Over the course of 295 total patient days, there were 28 urgent alerts

for 18 (15.4%) patients. Atrial fibrillation (AF) with a rapid ventricular response was the most common (15, 53.6%). There were five (17.9%) alerts for QTc>500ms (**Table 1**). An electrophysiologist was contacted for urgent events within 3-5 minutes. Of the 28 urgent alerts, 12 did not warrant intervention (e.g. first-degree atrioventricular block).

From a baseline mean QTc of 437.1±22.2ms, the average increase in QTc for the entire population was 33.9±26.8ms (Table 1). The maximum QTc was similar in patients treated with HCQ versus HCQ+AZM (448.5±33.7ms vs. 451.9±29.2ms, p=0.58). The change in QTc from baseline was also similar (32.1±25.1ms vs. 35.7±28.9ms, p=0.66). HCQ was discontinued in one patient after three days due to QTc prolongation from 460ms to 565ms.

This study demonstrates that when hospital admission rates exceed the capacity of telemetry beds, the MCOT may be used to monitor for arrhythmias and assess the QTc. In 2017, the MCOT, which consists of a sensor and monitor network that communicate via Bluetooth, was FDA-approved for QTc measurement, analysis, and reporting. Once gathered, the data is forwarded to the monitor for analysis. After each use, MCOT may be rapidly "redeployed" to another patient.

In our experience, twenty-eight "urgent alerts" were communicated in near real-time to an electrophysiologist, of which 16 alerts resulted in management changes. In addition to the "urgent alerts," the MCOT afforded electrophysiologists the ability to monitor for QTc changes. While HCQ±AZM may put patients at higher risk for drug-induced arrhythmias, none of our patients had arrhythmias that led to medication discontinuation. The MCOT also allowed for better utilization of HCPs and resources. By eliminating the need for serial ECGs, we reduced both HCP exposures and PPE use.

The limitations of MCOT include that the device was never approved to measure QTc for patients with AF or atrial flutter, QRS >160ms, and T-wave <5% of the peak QRS amplitude. The single-center, non-randomized study design, and a healthy population from a cardiac standpoint, are other limitations. The MCOT must be used with caution in patients with significant cardiac disease.

In conclusion, innovative management of COVID-19 patients treated with HCQ±AZM is needed given the limited healthcare resources. The MCOT may be utilized for arrhythmia and QTc monitoring while reducing both HCP exposures and PPE use.

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Table 1: MCOT Urgent Alerts and QTc Measurement of the Study Cohort

Urgent Alerts (N=28)				
Atrial Fibrillation with a Rapid Ventricular Response			15 (53.6%)	
QTc >500ms			5 (17.9%)	
First Degree Atrioventricular Block			4 (14.3%)	
Nonsustained Ventricular Tachycardia			2 (7.1%)	
Ventricular Bigeminy			1 (3.6%)	
Supraventricular Tachycardia			1 (3.6%)	
QTc Measurements				
QTc Parameters	Overall (N=117)	HCQ (N=66)	HCQ+AZM (N=51)	P-Value
Baseline QTc	437.1 ± 22.2	438.1 ± 23.8	435.8 ± 19.9	0.591
Maximal QTc	449.9 ± 31.7	448.5 ± 33.7	451.9 ± 29.2	0.575
Maximal QTc – Baseline QTc	33.9 ± 26.9	32.1 ± 25.1	35.7 ± 28.9	0.662

Final QTc	441.2 ± 28.7	440.0 ± 32.1	443.3 ± 23.6	0.54
Final QTc – Baseline QTc	7.3 ± 30.7	3.9 ± 31.9	12.8 ± 29.3	0.247

Values listed are numbers (percentages) or means±standard deviations. AZM=Azithromycin; HCQ=Hydroxychloroquine; QTc=Corrected QT.