Impact of a cardiology consultation integrated with primary care in the follow-up of patients with chronic heart disease

Impacto de una consulta de cardiología integrada con atención primaria en el seguimiento de pacientes con enfermedad cardiaca crónica

To the Editor,

The number of patients requiring long-term cardiology follow-up is continually increasing and traditional consultation models are unable to effectively meet demand. Accordingly, scientific societies are proposing the development of new methods that guarantee adequate coordination among the levels of care involved.[1]

Until 2011, our health care area relied on a traditional consultation model (25 face-to-face patient visits per day) in which referrals were not screened. In 2013, a new model was implemented: the MIVICORE model (*Modelo integrado de atención primaria y cardiología: consulta virtual, cardiólogo consultor, consulta de alta resolución* [integrated model of primary and cardiology care: virtual clinic, consultant cardiologist, one-stop clinic]). In this model, primary care (PC) has direct access to a cardiologist via the virtual clinic. These teleconsultations involve an electrocardiogram and are answered in 24 to 48 hours with a decision regarding the need for an assessment in the one-stop clinic. In 2017, our group showed that this model reduced the number of in-person visits and delays.[2]

Here, we studied the impact of the MIVICORE model on the follow-up of our patients. To do so, we compared all-cause and cardiovascular death between the traditional consultation model and the MIVICORE model, as well as a composite of all-cause death, number of hospitalizations for cardiovascular reasons, and emergency department visits for cardiovascular reasons. Also evaluated was the number of in-person cardiology consultations in both groups.

Accordingly, we designed a prospective observational study that included patients with chronic heart disease: permanent atrial fibrillation, chronic coronary syndrome, heart failure with ejection fraction > 40%, and mild or moderate valvular heart disease. We excluded patients with hospitalization or interventional procedures for cardiological reasons in the preceding year, ejection fraction < 40%, heart disease diagnosis within < 1 year, therapy with class I and III antiarrhythmic drugs according to the Vaughan Williams classification, or estimated life expectancy < 1 year. Patients in the traditional model continued to undergo in-person cardiology visits, whereas those in the MIVICORE model migrated to PC follow-up with virtual support from cardiology. Consensus protocols were developed with the new referral criteria. Follow-up was performed at 1 year for each patient.

The study was approved by the Ethics Committee of Our Lady of Candelaria University Hospital. Informed consent was obtained from included patients.

In the statistical analysis, Kaplan-Meier survival curves were calculated; they were compared using the log-rank test. A Cox proportional hazards model was adjusted with the composite of all-cause death, number of hospitalizations for cardiovascular reasons, and emergency department visits for cardiovascular reasons as the dependent variable and age, sex, hypertension, diabetes, dyslipidemia, chronic kidney disease, and consultation model as independent variables.

Table 1
Patient characteristics at inclusion and at 1 year of follow-up under the 2 consultation models.

	Traditional (n = 497)	MIVICORE (n = 497)	*P*
Age, y	70.4 ± 11.5	71.8 ± 11.3	.042
Sex (male/female), n	347/150	331/166	.276
Smoking	85 (17.1)	91 (18)	.517
Hypertension	370 (74.4)	382 (76.8)	.375
Diabetes mellitus	175 (35.02)	160 (32.2)	.314
Dyslipidemia	330 (66.4)	340 (68.4)	.499
Chronic kidney disease	110 (22.1)	150 (30.2)	.009
Anemia	72 (14.5)	85 (17.1)	.364
Stroke	39 (7.8)	34 (6.8)	.543
Glomerular filtration rate, mL/min/1.73 m²	73.9 (20.6)	69.8 (21.0)	.002
Disease			.644
Permanent atrial fibrillation	173 (34.8)	167 (33.6)	
Heart failure with LVEF > 40%	17 (3.4)	12 (2.40)	
Chronic coronary syndrome	274 (55.1)	278 (56)	
Mild or moderate valvular heart disease	33 (6.7)	40 (8.00)	
Ejection fraction, %	60.72 ± 6.04	62.04 ± 5.54	.297
1-y follow-up			
All-cause mortality	15 (3.02)	14 (2.82)	.851
Cardiovascular mortality	3 (0.6)	1 (0.2)	.598
All-cause mortality, number of hospitalizations for cardiovascular reasons, and emergency department visits for cardiovascular reasons	51 (10.26)	33 (6.63)	.04
Total number of consultations, n	480	54	< .001

LVEF, left ventricular ejection fraction.
Unless otherwise indicated, the data represent No. (%) or mean ± standard deviation.

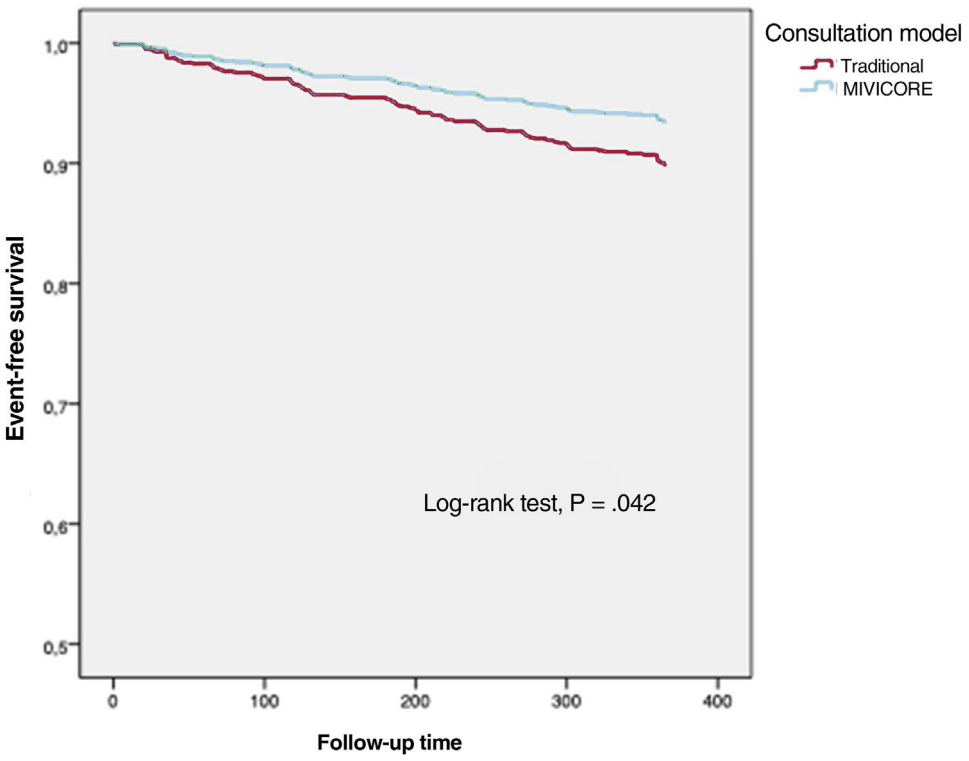

Figure 1. Kaplan-Meier survival curve of the composite event of all-cause death, number of hospitalizations for cardiovascular reasons, and emergency department visits for cardiovascular reasons by consultation model.

Between April 2018 and April 2019, we included 1000 patients assessed in the cardiology clinics (500 patients under each model). The patients were incorporated into either of the 2 groups based on the consultation model implemented in their health center. Three patients were lost to follow-up in each group.

The MIVICORE model patients were older (71.8 ± 11.3 vs 70.4 ± 11.5 years; $P = .042$) and had a higher percentage of chronic kidney disease (30.1% vs 22.1%; $P = .009$). The 2 groups were homogeneous in terms of the remaining variables and cardiac treatments (table 1).

The heart disease leading to inclusion was similar in the 2 groups; the most frequent cause was chronic coronary syndrome, followed by permanent atrial fibrillation, mild or moderate valvular heart disease, and heart failure with ejection fraction > 40%.

At the 1-year follow-up, there were no differences in all-cause death (3.02% vs 2.82%; $P = .851$) or cardiovascular mortality (0.6% vs 0.2%; $P = .598$). The patients in the traditional model showed a higher number of events of the composite of all-cause death, number of hospitalizations for cardiovascular reasons, and emergency department visits for cardiovascular reasons (10.26% vs 6.63%; $P = .04$). The consultation model (hazard ratio = 1.752; 95% confidence interval, 1.084-2.830; $P = .022$) and chronic kidney disease (hazard ratio = 2.697; 95% confidence interval, 1.593-4.566; $P \leq .001$) were identified as predictors of the composite event. The Kaplan-Meier survival curve is shown in figure 1.

In total, 480 consultations were made under the traditional model vs 54 under the new model ($P < .001$). In addition, 80.7% of the patients in the traditional model made at least 1 in-person cardiology consultation; 80.04% of these consultations did not prompt diagnostic tests or therapeutic changes. Conversely, 91.3% of the MIVICORE model patients did not require an in-person cardiology consultation.

Our study shows that patients with stable chronic heart diseases can be safely followed up by PC as long as fluid communication is guaranteed with cardiology. Favorable clinical outcomes were obtained, with a decrease in the composite of death and hospitalizations, as well as a reduction in face-to-face consultations. These results should guide the search for multidisciplinary integration systems favoring appropriate continuity of care.

The present findings are in line with those published by Falces et al.[3] in their study of one-stop cardiology clinics and by Comín et al.[4] in their integration program involving patients with heart failure. Similarly, Rey Aldana et al.[5] have reported that a program incorporating e-consultations reduces waiting times, hospitalizations, and mortality. Although multiple factors may be involved, we believe that the factors most strongly influencing these good outcomes may be the existence of shared protocols, the rapid access via the virtual platform, the minimal delay to in-person care, and the high resolution capacity. This new model generates high satisfaction for PC physicians.[6]

Taken together, we believe that health care systems must implement a consultation model integrated with PC that can reduce delays, in-person visits, and hospital attendance, as well as satisfy professionals.

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AUTHORS' CONTRIBUTIONS

All authors contributed to the study design. R. Pimienta González, A. Quijada Fumero, and C. Hernández enrolled the patients. R. Pimienta González, E. Pérez Cánovas, and Z. Morales Rodríguez performed the data analysis. R. Pimienta González and J.S. Hernández Afonso drafted the article. All authors revised the

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CONFLICTS OF INTEREST

None.

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Acute myocarditis after a third dose of the BNT162b2 COVID-19 vaccine

Miocarditis aguda tras la tercera dosis de la vacuna BNT162b2 contra la COVID-19

To the Editor,

Cases of acute myocarditis have been reported in relation to SARS-CoV-2 infection, and after administration of the first and second dose of the BNT162b2 vaccine[1] or a single dose of Ad26.COV2.S.[2]

We describe the clinical case of a 24-year-old man with Crohn's disease, receiving treatment with adalimumab, which was discontinued on his own account 4 months before hospital admission. He had been vaccinated with the complete regimen (2 doses) of BNT162b2 while off treatment with adalimumab. At the second dose, he noted self-limited chest pain, with no other clinical signs or symptoms.

At 24 hours after receiving the third dose of BNT162b2, the patient experienced pericardial chest pain and a low-grade fever of 37.6 °C. On emergency room admission, the electrocardiogram showed sinus rhythm at 71 bpm and a diffuse, concave ST-segment elevation consistent with acute pericarditis (figure 1). Ultrasensitive troponin I analysis yielded an initial value of 11,183 ng/L (normal, < 34 ng/L), a peak of 17,650 ng/L at 4 hours after admission, and a subsequent descending curve that reached 135 ng/L at 5 days. Serological tests for cardiotropic pathogens were negative for IgM, and basic autoimmunity screening was negative.[3]

Polymerase chain reaction (PCR) testing for SARS-CoV-2 was negative in 2 nasopharyngeal swabs taken 2 days apart. SARS-CoV-2 IgM and IgG serological tests were not available.

There were no segmental contractility abnormalities or pericardial effusion on transthoracic echocardiography, and the left ventricular (LV) ejection fraction was 56%. The total longitudinal strain showed changes in the basal anterolateral and mid-anterolateral segmental deformation (–14%) in the apical view. The patient remained asymptomatic after starting ibuprofen 600 mg/8 h and colchicine 0.5 mg/12 h. Cardiac magnetic resonance imaging showed no segmental contraction abnormalities and preserved LV systolic function (53%). T2-weighted STIR sequences depicted hyperintensities indicative of edema in the basal inferior and lateral segments, midlateral segment, and apical anterior, lateral, and inferior segments. Pericardial thickness was normal and there was no pericardial effusion. Myocardial late gadolinium imaging detected patchy, subepicardial enhancement in the above-mentioned segments (figure 2).

Based on these findings, a diagnosis was established of acute myocarditis predominantly affecting the lateral LV wall. The involvement of various myocardial segments corresponding to different coronary territories and the excellent clinical progression with anti-inflammatory treatment in a young patient with low cardiovascular risk led to exclusion of coronary anatomical study and endomyocardial biopsy.

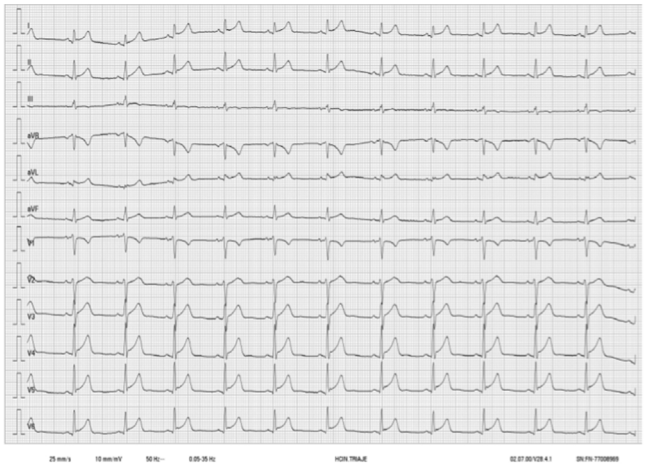

Figure 1. Electrocardiogram showing sinus rhythm with a diffuse concave ST segment elevation (> 1 mm) and a PR segment elevation in lead aVR.