FACULDADE DE MEDICINA
UNIVERSIDADE DO PORTO

MESTRADO INTEGRADO EM MEDICINA

2023/2024

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Management of cardiovascular risk factors in post-ACS patients: The influence of a structured coronary-disease cardiology consultation (SCCC) program

Março, 2024

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Mestrado Integrado em Medicina

Área: Ciências Médicas e da Saúde

Tipologia: Dissertação

Trabalho efetuado sob a Orientação de:

Professor Doutor Ricardo Manuel Alves Monteiro Fontes Carvalho e sob a

Coorientação de: Professora Doutora Sílvia Diaz

Trabalho organizado de acordo com as normas da revista:
European Journal of Preventive Cardiology

Março, 2024

FMUP

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DESIGNAÇÃO DA ÁREA DO PROJECTO

Ciências Médicas e da Saúde

TÍTULO DISSERTAÇÃO

Management of cardiovascular risk factors in post-ACS patients: The influence of a structured coronary-disease cardiology consultation (SCCC) program

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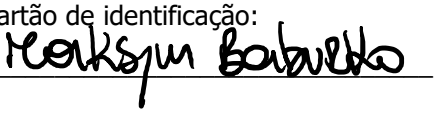

Dedicatória

Aos meus pais, Mykhaylo e Lyudmyla, que não mediram esforços para que eu tivesse oportunidade de estudar Medicina. À minha irmã Catarina, que juntamente com os meus pais sempre acreditou em mim perante as várias adversidades desta incrível jornada académica, À minha família dedico esta dissertação

Management of cardiovascular risk factors in post-ACS patients: The influence of a structured coronary-disease cardiology consultation (SCCC) program

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FUNDING
This work was financed by national funds through FCT Fundação para a Ciência e a Technology, I.P., within the scope of the Cardiovascular R&D Center (UIDB/00051/2020 and UIDP/00051/2020) and RISE (LA/P/0053/2020).

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TOTAL WORD COUNT: 6,353 words

ABSTRACT

Aims: After an acute coronary syndrome (ACS) several therapies have shown to significantly improve the prognosis. However, their implementation in "real world" setting remains suboptimal and few patients achieve the recommended goals. This study aimed to evaluate the impact of a new Structured Coronary-Disease Cardiology Consultation Follow-up Program (SCCC) to optimize the control of CV risk factors in post-ACS patients.

Methods: We performed a retrospective analysis comparing two patient cohorts: the SCCC group as the program group versus the Regular Cardiology Consultation (RCC) group as the historical control group. The primary outcome was the control of several CV risk factors such as low-density lipoprotein-cholesterol (LDL-C) levels, glycated hemoglobin (HbA1c) in diabetic patients, systolic blood pressure (SBP), and smoking cessation 12-months after the event. Intragroup analysis was performed using paired Wilcoxon tests. The program's impact was assessed via analysis of covariance (ANCOVA) and logistic regression.

Results: A total of 521 patients were included in this analysis (237 SCCC vs 284 RCC). Patients included in the SCCC program experienced a significant reduction of LDL-C levels [99.00(IQR:74.00,126.00) mg/dL to 52.00(IQR:43.00,66.00) mg/dL,$p<0.001$], HbA1c levels [7.00%(IQR:6.30,7.60) to 6.40%(IQR:6.10,6.85),$p<0.001$] and SBP levels [134.00(IQR:120.00,145.00) mmHg to 130.00(IQR:117.00,140.00) mmHg,$p<0.001$], compared to baseline. The ANCOVA analysis demonstrated that the SCCC program had a significant impact in LDL-C levels [β =-13(-19,-6.4),$p<0.001$], HbA1c [β =-0.49(-0.91,-0.06),$p=0.026$] and SBP [β =-3.5(-6.3,-0.59), $p=0.018$] control. No significant impact of the SCCC program was detected on smoking cessation ($p>0.9$).

Conclusion: A new SCCC follow-up program allowed a significant reduction in LDL-C values, improved glycemic control, and reduced arterial blood pressure 12 months after an ACS.

KEYWORDS: Acute coronary syndrome; Diabetes *mellitus*; Dyslipidemia; Arterial hypertension; Secondary prevention; Smoking cessation.

LAY SUMMARY

Acute Coronary Syndrome (ACS) is a manifestation of coronary heart disease that contributes significantly to global morbidity and mortality due to cardiovascular disease. Cardiovascular risk factors (CVRF) like low-density lipoprotein-cholesterol (LDL-C), glycated hemoglobin (HbA1c), systolic blood pressure (SBP) and smoking, play a pivotal role in coronary disease progression. Although these factors are widely recognised, controlling them remains a challenge. Despite the wide availability of therapies that can assist in the control of various CVRF the latter remains suboptimal. This fact led to an increased interest in the development of new forms to organize and optimize the delivery of care.

Our study aimed to assess the effectiveness of a Structured Coronary-Disease Cardiology Consultation (SCCC) program in mitigating CVRF post-ACS. Our findings indicated that patients subjected to the SCCC program exhibited a greater reduction of their baseline LDL-C, HbA1c and SBP levels compared to regular cardiology follow-up after an ACS event. This emphasizes the benefits of structured follow-up programs in enhancing post-ACS care and improving outcomes after a cardiac event.

Introduction

An acute coronary syndrome (ACS) is a challenging manifestation of ischaemic heart disease, which accounts for substantial morbidity and mortality (1-4). Scientific evidence clearly shows that optimization of medical therapy, coupled with lifestyle changes and the judicious use of revascularization procedures are pivotal to improve patients' prognosis and quality of life (5, 6).

Current guidelines are progressively recommending more ambitious goals for cardiovascular (CV) risk factors (CVRF) control in secondary prevention (7). According to current European Society of Cardiology (ECS) guidelines, a more demanding approach is advocated for cholesterol levels, targeting low-density lipoprotein cholesterol (LDL-C) levels <55 mg/dL (<1.4 mmol/L), with a concurrent LDL-C reduction of >50% from baseline (7). Also, a target glycated hemoglobin (HbA1c) <7% (<53 mmol/mol) or lower in type 2 diabetes mellitus (DM) is suggested (8). As for arterial blood pressure (BP), treatment targets for systolic BP (SBP) range between 120-130 mmHg in <70-year-old patients and <140 mmHg in older patients, while the diastolic BP (DBP) target is <80 mmHg (7).

Although data concurs as to the central role of secondary prevention strategies after an ACS, the proportion of patients who achieve these target levels remains largely suboptimal, leading to continuous and high-level interest in the implementation of strategies to organize the delivery of clinical care to optimize CVRF control and improve outcomes (9, 10).

While cardiac rehabilitation (CR) programs tackle several of these facets, they may fail to achieve recommended levels for CVRF (11, 12). Wittlinger *et al* reported that patients enrolled in a CR program reached their lowest LDL-C values in the first month after the ACS, revealing difficulty in maintaining the same values during the 12-month follow-up (13). Moreover, CR programs may not be suitable for all individuals, namely because of their timing or because of patients' physical limitations (14). Indeed, Peters *et al.* demonstrated that only one-third of patients participated in these programs, despite their potential benefits (11, 15, 16).

To address these challenges, some authors recommend the concept of a timely and evidence-based follow-up program for ACS patients, encompassing scheduled follow-up appointments, tailored nutritional and physical exercise recommendations, as well as education on several topics such as weight loss and smoking (5, 17). The French National Health Agency suggests an early and systematic evaluation for post-ACS patients following discharge to address potential adverse reactions that might hinder treatment compliance (18). The 2019 ESC guidelines for the management of chronic coronary syndromes also support this approach, recommending a first patient contact in the first weeks after discharge and suggesting an echocardiographic re-evaluation in the first 8 to 12 weeks (19).

In this background, we designed and implemented a new structured follow-up program for patients after an ACS, alongside a CR program. This Structured Coronary Artery Disease Cardiology Consultation (SCCC) framework aimed to standardise follow-up after discharge, namely by including early post-discharge re-evaluations, regular and predefined monitoring of CVRF and collaborating with ancillary areas such as nutrition and smoking cessation (regardless of inclusion in CR).

In this study we aimed to assess the impact of this SCCC program on the control of several CVRF after 12 months of follow-up.

METHODS

The SCCC program

The SCCC program was implemented in August 2021 at the Hospital Vila Nova de Gaia/Espinho and led by a Cardiologist. It allowed the inclusion of patients admitted to this hospital for myocardial infarction (MI; with or without ST-segment elevation) or unstable angina, according to the International Classification of Diseases (10th edition) (20). Type 2 MI were excluded given that these can be multifactorial and not necessarily associated with acute atherothrombotic plaque disruption (21).

Follow-up appointments with a cardiologist were scheduled at least at <2 and 12 months after the ACS. Additional evaluations were performed in those with CV symptoms, left ventricular ejection fraction (LVEF) <50%, uncontrolled CVRF or according to clinical status [Figure 1]. Over the course of the program, the patient engaged in a multidisciplinary setting, collaborating with highly trained specialists, including physicians, nurses, nutritionists and rehabilitation physiotherapists. In these appointments, personalized and informative discussions took place, focusing on lifestyle modifications, health education, and underscoring the importance of managing cardiovascular risk factors.

At 2 and 12 months, the program prespecified automatic assessment of blood tests encompassing a complete blood count, ionogram, renal and hepatic profiles, lipid profile, glucose, and HbA1c in patients with DM. A transthoracic echocardiogram (TTE) was performed at 12 months, or earlier in those with a reduced or mildly reduced LVEF at discharge. As for medical appointments, additional analytical and/or echocardiographic assessments could be undertaken according to clinical status.

At 12 months follow-up, asymptomatic patients, with no new events, preserved LVEF (or mildly reduced without changes in follow-up), and on optimized medical therapy were discharged to a general practitioner. Patients not meeting these criteria were discharged to the general cardiology consultation. Though the program was designed for a one-year follow-up, additional assessments up to 18 months after the event were also possible, after which patients were discharged (see above).

Study design

We conducted a retrospective and comparative analysis between two groups: the SCCC group encompassed patients admitted between August 2021 and July 2022 and followed in the SCCC program for at least 12 months; the Regular Cardiology Consultation (RCC) group was used as the historical control group and included patients with ACS admitted to the hospital from January to December 2018. Unlike the SCCC group, no specific predefined schedules for consultations or CVRF assessment were present in the RCC group, with follow-up being conducted according to the attending physician's judgment.

Patients who missed the 12-month follow-up were excluded from the analysis.

Clinical and analytical variables

Retrospective data collection from hospital records included baseline characteristics such as concomitant diseases [chronic kidney disease, peripheral artery disease, erectile dysfunction, atrial fibrillation, obstructive sleep apnea, stroke, cancer, and previous coronary artery disease (CAD)], presence of CVRF (arterial hypertension, dyslipidemia, DM, and smoking habits) at the time of ACS admission, as well as prior medical history. The data regarding patients' previous medical history was collected based on electronic clinical records.

Data related to CVRF levels at baseline (ACS admission date) and at the end of the 12-month follow-up (12-months appointment or the one closest to this date) were gathered. CVRF analysed included LDL-C, HbA1c, SBP and smoking habits (self-described).

Statistical analysis

Categorical variables were presented as counts and percentages, and continuous variables as median and interquartile range. Patient stratification was performed per intervention, and baseline characteristics were compared using the Chi-Square test, Fisher’s exact test or Wilcoxon tests, as appropriate.

In both groups, LDL-C, HbA1c, and SBP values at baseline were compared to values at the end of the follow-up. Intragroup paired analyses for each study variable were conducted using the

paired Wilcoxon test. HbA1c was evaluated only in those with type 2 DM. Patients with smoking habits were categorized based on whether they ceased or reduced smoking at the end of the follow-up.

The impact of the program on the variation of LDL-C, HbA1c, or SBP levels was assessed through an analysis of covariance (ANCOVA). For this, the statistical model was fitted with each parameter change (calculated as its value after 12 months of follow-up minus its value at baseline) as dependent variables. Baseline values (LDL-C, HbA1c, or SBP), along with age, sex, overweight/obesity, history of CAD, and a variable indicating the group (SCCC or RCC), were included as independent variables. The impact of the SCCC program on smoking cessation, compared to patients who reduced or remained active smokers, was evaluated through a logistic regression. Likewise, a variable indicating the group (SCCC or RCC), age, sex overweight/obesity, and history of CAD were included as independent variables.

Statistical analyses and graphical representations were conducted using the R statistical software, version 4.1.2 (22). A $p < 0.05$ was considered statistically significant.

Ethical approval

This study was approved by the Ethics Committee of Hospital Vila Nova de Gaia/Espinho in September 2022.

Results

A total of 521 patients were included in this analysis: 237 patients in the SCCC group and 284 patients from the RCC group.

Patients' baseline characteristics are depicted in Table 1. There were no significant differences in baseline characteristics between groups, except for a small difference in the prevalence of overweight/obesity [SCCC group: 71 (30%) vs. RCC group: 113 (40%), p=0.019] and previous history of CAD [SCCC: 43 (18%) vs. RCC group: 78 (27%), p=0.012]. The number of missing values for each variable is displayed in Supplementary Table 1.

Dyslipidemia

LDL-C levels were significantly reduced in the SCCC group, decreasing from 99.00 (IQR: 74.00, 126.00) mg/dL at baseline to 52.00 (IQR: 43.00, 66.00) mg/dL (p<0.001) at the end of the follow-up [Figure 2]. In the RCC group, LDL-C levels were reduced from 100.50 (IQR: 80.00, 142.00) mg/dL to 66.00 (IQR: 52.00, 83.00) mg/dL (p<0.001) [Figure 2].

The analysis of covariance (ANCOVA), adjusted for the covariates defined in the Methods, showed that the new SCCC program had a significant impact on improving the control of LDL-C levels [β= -13 (-19, -6.4), p<0.001] [Table 2]. The baseline LDL-C levels [β= -0.72 (-0.79, -0.64), p<0.001] and history of CAD [β = 9.7 (2.3, 17), p=0.010] were also associated with the change of LDL-C levels.

Diabetes *mellitus*

In the SCCC group there was a significant reduction in HbA1c values, from 7.00% (IQR: 6.30, 7.60) at baseline to 6.40% (IQR: 6.10, 6.85) (*p*<0.001) at the end of follow-up [Figure 3]. Conversely, in the RCC group no significant reduction in HbA1c levels was observed, from 7.10% (IQR: 6.40, 8.30) to 7.00% (IQR: 6.20, 7.80) (p=0.09) [Figure 3].

The ANCOVA demonstrated that the SCCC program had a significant impact on HbA1c levels among patients with type 2 DM [β = -0.49 (-0.91, -0.06), p= 0.026] [Table 2]. The baseline HbA1c levels [β = -0.53 (-0.69, -0.36), p<0.001] were also associated with the change in HbA1c.

Arterial hypertension

There was a significant difference from baseline to the end of the follow-up period in the SCCC group in terms of SBP [134.00 (IQR: 120.00, 145.00) mmHg at baseline vs. 130.00 (IQR: 117.00, 140.00) mmHg at the end of the program, p < 0.001] [Figure 4]. In contrast, the RCC group exhibited no significant differences [130.00 (IQR: 114.00, 143.00) mmHg at baseline vs. 130.00 (IQR: 120.00, 141.00) mmHg at the end of the follow-up, p=0.23] [Figure 4].

Once again, the ANCOVA demonstrated that the SCCC program had a significant impact on SBP values change [β = -3.5 (-6.3, -0.59), p=0.018] [Table 2]. The baseline SBP levels [β = -0.53 [-0.60, -0.46], p=<0.001] were also associated with the change in SBP.

Smoking

Of the 69 active smokers in the SCCC group, 45 (65.2%) quit smoking, 6 (8.7%) reduced the number of smoked cigarettes and 18 (26.1%) continued to be active smokers 12 months after the event [Supplementary Figure 1, Supplementary Table 2]. In the SCCC group, 22 (31.9%) patients participated in smoking cessation appointments.

In the RCC group there were 87 active smokers at baseline. At the end of follow-up, 55 (63.2%) patients quit smoking, 2 (2.3%) reduced the number of smoked cigarettes, and 30 (34.5%) continued to be active smokers [Supplementary Figure 1, Supplementary Table 2]. In this group, about 19 (21.8%) patients participated in smoking cessation programs.

There were no significant differences between groups regarding the change in smoking habits at the end of the follow-up period [SCCC group: 45 (65.2%) stopped smoking vs. RCC group: 55 (63.2%) stopped smoking, p=0.14] [Supplementary Figure 1]. According to the logistic

regression, the SCCC program had no significant impact on smoking cessation [OR = 1.01 (0.50, 2.04), p > 0.9] [Supplementary Table 3]. Prior history of CAD was associated with lower odds of smoking cessation [OR = 0.24 (0.08, 0.63), p=0.005].

DISCUSSION

In this study we showed that the implementation of a structured program of patient follow-up after an ACS was associated with significant improvements in LDL-C, HbA1c (in those with DM) and SBP levels after 12 months of follow-up. These were significantly lower when compared to standard follow-up strategies, and closely aligned with the targets established by the latest guidelines for post-ACS patient management. The SCCC program emerged as a multifaceted variant to CR programs, addressing some of their handicaps such as limited patient coverage and elevated drop-out rates (9, 16). Furthermore, the program facilitated attending to the needs of complex patients with multimorbidity, a significant challenge with which several CR programs grapple.

The effect of the SCCC program on LDL-C levels

In our study we observed a significant decrease in LDL levels from a median of 99.00 mg/dL to 52.00 mg/dL at the end of the 12 months follow-up. These values were significantly lower compared to other studies in the literature employing structured follow-up programs in secondary prevention. Silva *et al* reported median LDL-C values of 66 (52-82) mg/dL after an 8-week follow-up (with median post-ACS baseline values of 107 mg/dL), focusing on highly compliant post-ACS patients undergoing a CR program (10). In another study, Anselm K Gitt et *al* demonstrated that post-ACS patients treated with LDL-lowering drugs reduced their LDL-C levels from a mean of 108.1 mg/dL to 97.2 mg/dL after a follow-up of 4 months (2). While these studies had shorter follow-up periods, they documented better patient compliance immediately after the acute CV event, an effect that diminishes over time (19). In a different study, Wittlinger *et al* followed post-ACS patients for 12 months, noting a decrease in LDL-C values from 91.4 (±30.8) mg/dL at baseline to 79.3 (±27.2) mg/dL at the end of follow-up (13).

We think that the success of the SCCC program in secondary prevention is linked to standardized and frequent measurements of CVRF enabling tailored medication prescriptions. This underscores the impact of a more rigorous and time-effective schedule of follow-up consultations

and an intensified physician-patient relationship, especially in the first year post-ACS. The protocolized monitoring of cholesterol levels is, in part, responsible for a higher awareness of the patient's lipid profile by the clinicians, allowing prompt pharmacological intervention, as well as compliance assessment and reinforcement. Additionally, it facilitates addressing any reported side effects and enhances patient´s engagement in their treatment. The program's success is also supported by early referrals to nutrition appointments and the continuous contact with various healthcare professionals (nurses, physicians) which allowed to emphasize and instil the importance of controlling patients LDL-C levels. These factors, combined with the more stringent targets recommended in the latest guidelines, have enabled us to achieve lower LDL-C values.

The effect of the SCCC program on HbA1c

Measuring HbA1c in all patients admitted for ACS is an important method of DM screening. However, the real challenge lies in maintaining controlled HbA1c levels, as inadequate blood glucose control is linked to adverse CV events (8). In our study, the SCCC program group achieved median HbA1c levels < 7.0% at the end of follow-up. These values were similar to the ones reported by Silva *et al*, although they were collected over a longer follow-up period, benefiting less from the phenomenon of increased compliance immediately after the ACS (10). In another study, Denegri *et al* also observed a reduction of HbA1c values among patients with type 2 DM submitted to a 3-month CR program (from 7.70% to 7.50 %) (23). These results fall short of those observed in our study, enhancing the role of the SCCC in decreasing and maintaining HbA1c levels in the critical distant period after an ACS.

The effect of the SCCC program on blood pressure control

Although the variation in SBP values was superior in the SCCC group, the higher values at baseline in this group could justify that, at the end of the follow-up, there were no significant differences between the two groups. Nevertheless, the ANCOVA analysis showed that our structured follow-up program for post-ACS patients was associated with a greater reduction of SBP values. Given that arterial hypertension is a prevalent manifestation of atherosclerosis

disease, this outcome further strengthens the effectiveness of SCCC program, addressing multiple CVRF simultaneously in a real-world population.

The effect of the SCCC program on smoking cessation

While the SCCC program did not show a significant effect on smoking cessation, our study unveiled a noteworthy success rate of 65.2%, surpassing values observed in other studies (45% smoking cessation following an ACS) (24). The program further reinforces previous findings that factors like a referral to CR programs influence smoking cessation rates.

According to our results, patients with previous history of CAD were more prone to exhibit lower LDL-C reduction at the end of 12-month follow-up [$\beta = 9.7$ (2.3, 17), $p = 0.010$] [Table 2] and less susceptible to stop smoking [OR = 0.24 (0.08, 0.63), $p > 0.005$] [Supplementary Table 3]. These data underscore the heightened risk of ACS recurrence and emphasize that the targets may be harder to reach in individuals with a history of previous CAD.

These outcomes underline the importance of comprehensive and multidisciplinary care in managing post-ACS patients, placing the SCCC program at the forefront to achieve the much-coveted objectives for CVRF.

<u>Study Limitations</u>

Although providing valuable insights, this study has some limitations. Firstly, the relatively small sample sizes and uneven patient distribution between groups should be considered. Secondly, while both groups were similar, there were some differences between them (as depicted in Table 1).The differences in the number of overweight/obese patients and in prior history of CAD could result, at least in part, from increased health literacy in the general population and heightened preventive measures, raising awareness to numerous CVRF such as obesity, smoking, dyslipidemia, and arterial hypertension (25, 26).

Furthermore, the 3-year gap between the follow-up of both groups may introduce bias, considering new treatment options and new recommendations developed during this period. We

chose a period before the years 2020 and 2021 to avoid the possible bias associated with the coronavirus disease pandemic (27). Patients with ACS in 2019 were also excluded since their 12-month follow-up period overlaps with the coronavirus pandemic of 2020.

Thirdly, these data pertain to a single centre and as such, generalization of these findings should be cautious. Finally, survival bias should also be acknowledged. Since there were individuals who died or experienced other health complications that led to their absence from the 12-month assessment, our sample may be biased towards "healthier" patients. Albeit this, the missing data, particularly in the RCC group, highlights the impact of the SCCC program in monitoring and collecting data concerning CVRF.

While these points should be considered, the study provides important real-world data regarding CVRF control in post-ACS patients, which may be of use in optimizing the implementation of secondary prevention strategies in this challenging and very high-risk patient population.

CONCLUSION

This study demonstrated that the implementation of a structured coronary-disease follow-up framework after an ACS can lead to significant improvements in LDL-C, HbA1c, and SBP levels at one year follow-up, these being greater than those attained prior to this programs' inception. These findings endorse the importance of implementing multidisciplinary structured programs for post-ACS patients, to improve CVRF control.

Conflict of interest

The authors have no conflicts of interest to declare.

Funding

This study was funded by national funds through FCT - Portuguese Foundation for Science and Technology, under the scope of the Cardiovascular R&D Center – UnIC (UIDB/00051/2020 and UIDP/00051/2020).

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Figure Legends

Table 1. Baseline Patients' Characteristics

Figure 1. Schematic representation of SCCC program.

Figure 2. Violin plot representation of the variation of LDL-C at admission and at the end of the follow-up. Only patients with baseline and 12-month data for LDL-C were included in this analysis.

Table 2. Changes in LDL-C, HbA1c and SBP, from baseline to the end of the intervention period (ANCOVA analysis). The baseline values for each study variable were considered as predictors of value variation.

Figure 3. Violin plot representation of the variation of HbA1c levels at admission and at the end of the follow-up. Only patients with type 2 DM and with baseline and 12-month data for HbA1c were included in this analysis.

Figure 4. Violin plot representation of the variation of SBP at admission and at the end of the follow-up. Only patients with baseline and 12-month data for SBP were included in this analysis.

Supplementary Table 1. Number of missing values for LDL-C, SBP, and HbA1c at baseline and at the end of follow-up.

Supplementary Table 2. Smoking Status

Supplementary Figure 1. Barplot representation of the percentage of active smokers at baseline and that stopped, reduced, or continued to be active smokers at the end of the follow-up. Only patients with baseline and 12-month data for smoking habits were included in this analysis.

Supplementary Table 3: Effect of the program on smoking cessation at the end of the follow-up. For this analysis, only active smokers at baseline were considered.

Supplementary Table 4. LDL-C, SBP and HbA1c levels at the baseline and at the end of the follow-up.

Appendices

Supplementary Table 1. Number of missing values for LDL-C, SBP, and HbA1c at baseline and at the end of follow-up.

Supplementary Figure 1. Barplot representation of the percentage of active smokers at baseline and that stopped, reduced, or continued to be active smokers at the end of the follow-up. Only patients with baseline and 12-month data for smoking habits were included in this analysis.

Supplementary Table 2. Smoking Status

Supplementary Table 3: Effect of the program on smoking cessation at the end of the follow-up. For this analysis, only active smokers at baseline were considered.

Supplementary Table 4. LDL-C, SBP and HbA1c levels at the baseline and at the end of the follow-up.

Intergroup analysis

For the intergroup comparison at each timepoint (baseline and 12-months follow-up) all patients with available LDL-C, HBA1c and SBP data were considered.

While there was no significant difference in the median LDL-C values at baseline between the two groups [SCCC group: 100.00 (IQR: 74.00, 126.00) mg/dL vs. RCC group: 98.00 (IQR: 76.00, 131.00) mg/dL, p=0.7], their values at the end of the follow-up [SCCC group: 52.00 (IQR: 43.00, 66.00) mg/dL vs. RCC group: 66.00 (IQR: 53.00, 84.00) mg/dL, p<0.001] were significantly different, with the SCCC group achieving lower LDL values (Supplementary Table 4).

No significant differences in median HbA1c at baseline were observed between the two groups [SCCC group: 6.90% (IQR: 6.30, 7.65) vs. RCC group: 7.10% (IQR: 6.40, 8.30), p=0.2]. However, a significant difference emerged at the end of the follow-up period [SCCC group: 6.40% (IQR: 6.10, 6.85) vs. RCC group: 7.00% (IQR:6.30, 7.80), p=0.007], with lower HbA1c values achieved in patients with type 2 DM submitted to the SCCC program (Supplementary Table 4).

A significant difference was noted in the median SBP values between both groups at baseline, with higher SBP values observed in the SCCC group [SCCC group: 134.00 (IQR: 120.00, 145.00) mmHg vs. RCC group: 130.00 (IQR: 115.00, 143.00) mmHg, p=0.042]. However, at the end of the follow-up, no significant difference was detected between the study groups [SCCC group: 130.00 (IQR: 117.00, 140.00) mmHg vs. RCC group: 130.00 (IQR: 120.00, 141.00) mmHg, p=0.2] [Supplementary Table 4].

Data Availability

Only patients with baseline and end of follow-up values were included in the intragroup statistical analysis. There were 216 (91.1%) patients in the SCCC group and 138 (48.6%) patients in the RCC group with LDL-C levels measured both at baseline and at the end of the follow-up. Among the diabetic patients there were 60 (80.0%) patients in the SCCC group and 41 (44.1%) patients in the RCC with HbA1c levels measured at both time periods. Also, 217 (91.6%) patients in the SCCC group and 280 (98.6%) in the RCC group had SBP values reported both at baseline and the end of the follow-up.

Tables

Table 1. Baseline Patient Characteristics.

Variable	**RCC**, N = 284[1]	**SCCC**, N = 237[1]	**p-value**[2]
Gender			>0.9
Women	67 (24%)	56 (24%)	
Age	65 (55, 73)	64 (55, 75)	0.9
Dyslipidemia	184 (65%)	136 (57%)	0.084
Arterial Hypertension	181 (64%)	138 (58%)	0.2
Type 2 Diabetes *mellitus*	93 (33%)	75 (32%)	0.8
Overweight/Obesity[3]	113 (40%)	71 (30%)	**0.019**
Chronic kidney disease	20 (7.0%)	13 (5.5%)	0.5
Peripheral arterial disease	17 (6.0%)	10 (4.2%)	0.4
Erectile dysfunction	2 (0.7%)	2 (0.8%)	>0.9
Atrial fibrillation[4]	11 (3.9%)	8 (3.4%)	0.8
Obstructive sleep apnea	10 (3.5%)	14 (5.9%)	0.2
Heart failure	5 (1.8%)	8 (3.4%)	0.2
Stroke history	19 (6.7%)	10 (4.2%)	0.2
Cancer[5]	9 (3.2%)	13 (5.5%)	0.2
Smoking habits			0.7
Active smoker (<6months)	87 (31%)	77 (32%)	
No history of smoking	135 (48%)	115 (49%)	
Previous smoker (>6months)	62 (22%)	45 (19%)	
History of coronary disease	78 (27%)	43 (18%)	**0.012**
Family history of CVD	15 (5.3%)	9 (3.8%)	0.4

[1]n (%); Median (IQR); [2]Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test; [3]Overweight – body mass index >25, Obesity – body mass index > 30; [4]Atrial fibrillation includes paroxistical, persistent or permanent atrial fibrillation diagnosis; [5]Cancer with active treatment or history of cancer in the last 5 years.
BMI: Body Mass Index, CVD: Cardiovascular disease.

Table 2. Changes in LDL-C, HbA1c and SBP, from baseline to the end of the intervention period (ANCOVA analysis). The baseline values for each study variable were considered as predictors of value variation.

Cardiovascular Risk Factor	Characteristic	Beta [95% CI][1]	p-value
LDL-C change	LDL Baseline	-0.72 [-0.79, -0.64]	**<0.001**
	Woman	1.5 [-5.2, 8.2]	0.7
	Age	-0.07 [-0.32, 0.18]	0.6
	Obesity	-3.6 [-9.6, 2.4]	0.2
	HCAD	9.7 [2.3, 17]	**0.010**
	Intervention		
	RCC	—	
	SCCC	-13 [-19, -6.4]	**<0.001**
HbA1C change (type 2 DM)	HbA1c Baseline	-0.53 [-0.69, -0.36]	**<0.001**
	Woman	0.11 [-0.36, 0.58]	0.6
	Age	-0.01 [-0.03, 0.02]	0.5
	Obesity	-0.01 [-0.43, 0.41]	>0.9
	HCAD	-0.19 [-0.63, 0.26]	0.4
	Intervention		
	RCC	—	
	SCCC	-0.49 [-0.91, -0.06]	**0.026**
SBP change	SBP Baseline	-0.53 [-0.60, -0.46]	**<0.001**
	Woman	-2.3 [-5.8, 1.1]	0.2
	Age	0.07 [-0.05, 0.20]	0.2
	Obesity	0.98 [-2.0, 4.0]	0.5
	HCAD	1.1 [-2.3, 4.6]	0.5
	Intervention		
	RCC	—	
	SCCC	-3.5 [-6.3, -0.59]	**0.018**

[1]CI = Confidence Interval; LDL-C (N = 354), HbA1C (N = 101), and SBP (N = 497).

DM: Diabetes *mellitus;* HbA1c: Glycated hemoglobin; HCAD: History of previous coronary disease; LDL-C: Low-density lipoprotein-cholesterol; RCC: Regular cardiology consultation; SBP: Systolic Blood Pressure; SCCC: Structured Coronary-Disease Consultation.

Supplementary Table 1. Number of missing values for LDL-C, SBP, and HbA1c at baseline and at the end of follow-up.

Cardiovascular Risk Factor	**RCC**, N = 284	**SCCC**, N = 237
LDL-C Baseline	4 (1.41%)	4 (1.69%)
LDL-C End of Intervention	144 (50.7%)	19 (8.02%)
SBP Baseline	0 (0.0%)	3 (1.27%)
SBP End of Intervention	4 (1.41%)	18 (7.59%)
Only type 2 DM patients:	**RCC**, N = 93	**SCCC**, N = 75
HbA1c Baseline	6 (6.45%)	4 (5.33%)
HbA1c End of Intervention	50 (53.8%)	12 (5.06%)

DM: Diabetes *mellitus;* HbA1c: Glicated hemoglobin; LDL-C: Low-density lipoprotein-cholesterol; RCC: Regular cardiology consultation; SCCC: Structured coronary-disease consultation; SBP: Systolic blood pressure.

Supplementary Table 2. Smoking Status

Group	Baseline smoking status	N	FUP smoking status	N	%
RCC	Active smoker	87	Active smoker	30	34.5
			Reduce smoking	2	2.3
			Stop smoking	55	63.2
SCCC	Active smoker	69	Active smoker	18	26.1
			Reduce smoking	6	8.7
			Stop smoking	45	65.2

FUP: End of follow-up period; RCC: Regular cardiology consultation; SCCC: Structured coronary-disease consultation.

Supplementary Table 3. Effect of the program on smoking cessation at the end of the follow-up. For this analysis, only active smokers at baseline were considered.

FUP smoking status	Characteristic	OR[1]	95% CI[2]	p-value
Stop Smoking	Woman	1.07	0.41, 3.05	0.9
	Age	0.99	0.95, 1.03	0.6
	Obesity	1.07	0.49, 2.39	0.9
	HCAD	0.24	0.08, 0.63	**0.005**
	Intervention			
	RCC	—	—	
	SCCC	1.01	0.50, 2.04	>0.9

n = 156 [1]OR= Odds Ratio [2]CI = Confidence Interval

FUP: End of follow-up period; HCAD: History of previous coronary disease; RCC: Regular cardiology consultation; SCCC: Structured coronary-disease consultation.

Supplementary Table 4. LDL-C, SBP and HbA1c levels at the baseline and at the end of the follow-up.

Cardiovascular Risk Factor	**RCC,** N = 284[1]	**SCCC,** N = 237[1]	**p-value[2]**
LDL-C Baseline, mg/dL	98 (76, 131)	100 (74, 126)	0.7
LDL-C End of Intervention, mg/dL	66 (53, 84)	52 (43, 66)	<0.001
SBP Baseline, mmHg	130 (115, 143)	134 (120, 145)	0.042
SBP End of Intervention, mmHg	130 (120, 141)	130 (117, 140)	0.2
Only patients with type 2 DM	**RCC,** N = 93[1]	**SCCC,** N = 75[1]	
HbA1c Baseline, %	7.10 (6.40, 8.30)	6.90 (6.30, 7.65)	0.2
HbA1c End of intervention, %	7.00 (6.30, 7.80)	6.40 (6.10, 6.85)	0.007

[1]Median (IQR); n (%) [2]Wilcoxon rank sum test

DM: Diabetes *mellitus;* HbA1c: Glycated hemoglobin; LDL-C: Low-density lipoprotein-cholesterol; RCC: Regular cardiology consultation; SBP: Systolic blood pressure; SCCC: Structured coronary-disease consultation.

Figures

Figure 1. Schematic representation of SCCC program.

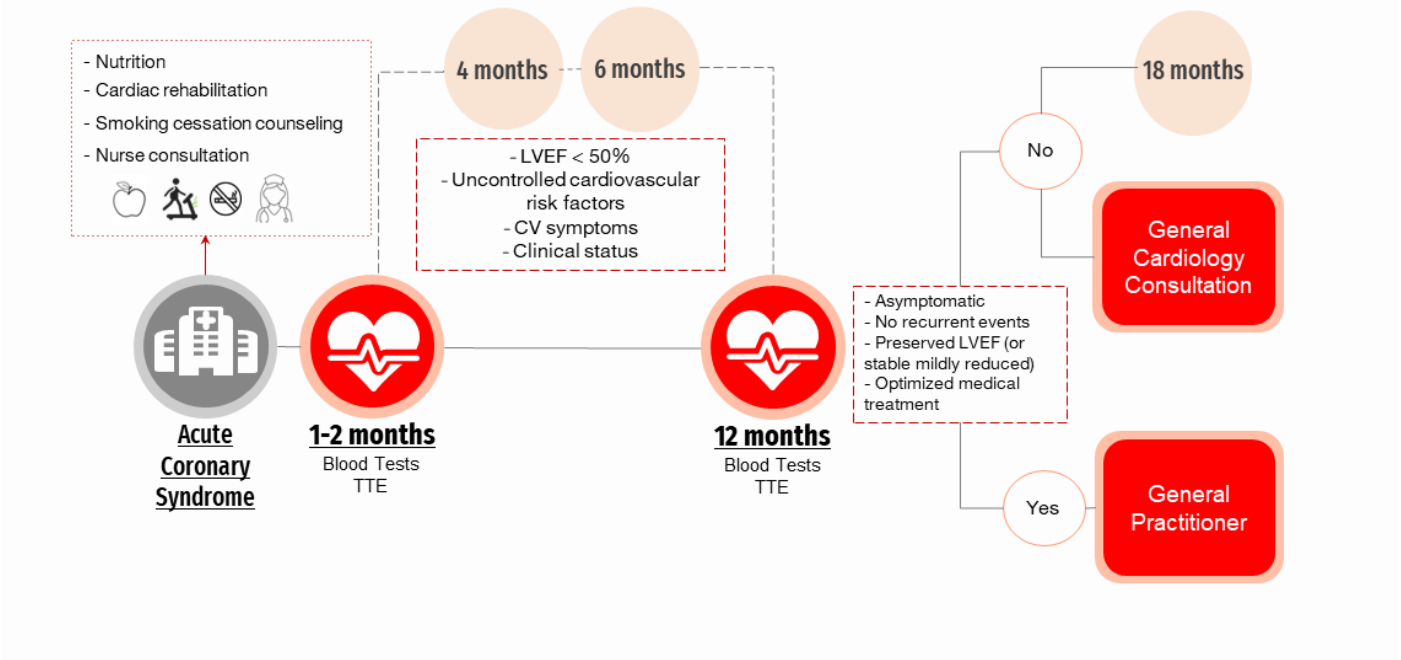


Figure 2. Violin plot representation of the variation of LDL-C at admission and at the end of the follow-up. Only patients with baseline and 12-month data for LDL-C were included in this analysis.

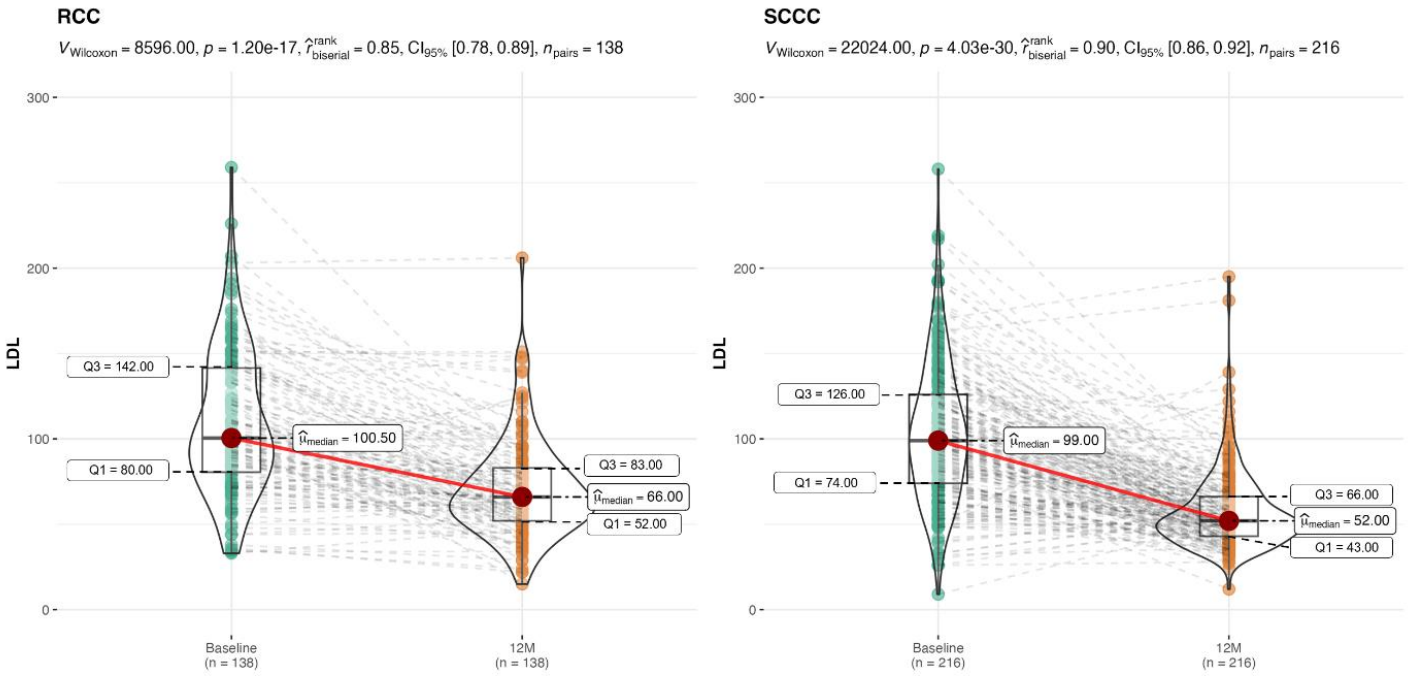


Figure 3. Violin plot representation of the variation of HbA1c levels at admission and at the end of the follow-up. Only patients with type 2 DM and with baseline and 12-month data for HbA1c were included in this analysis.

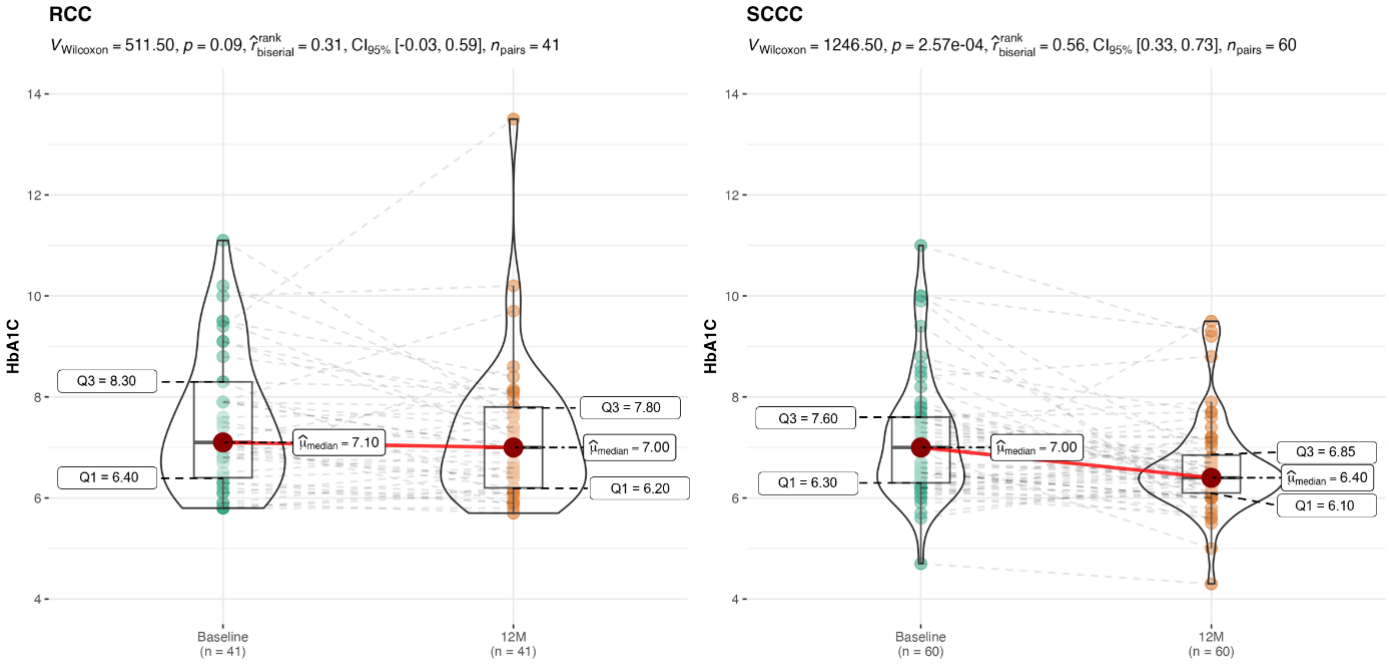
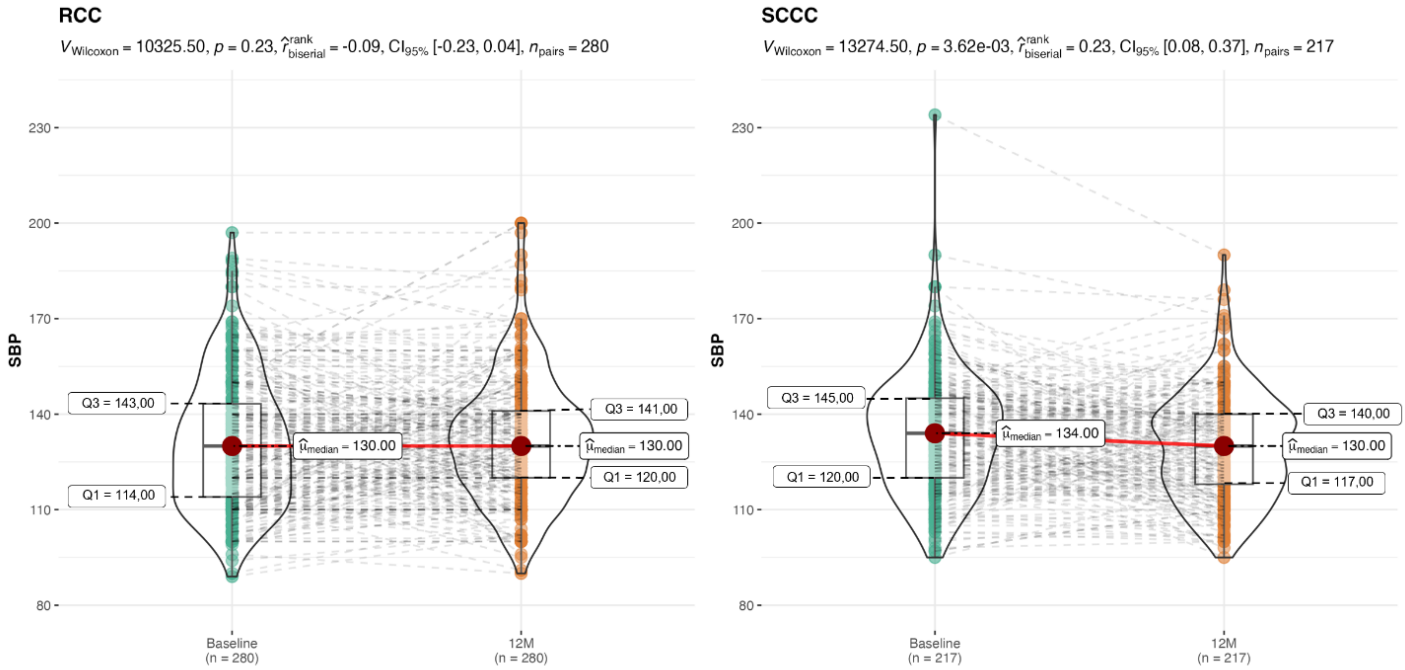
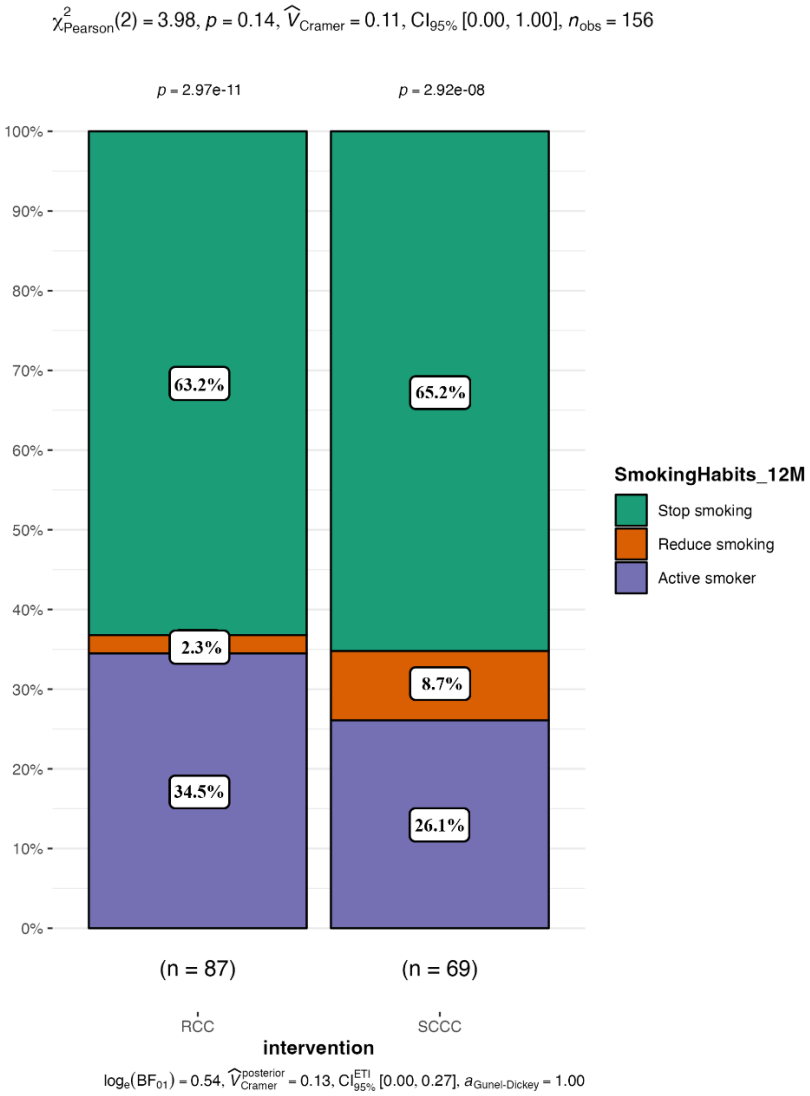


Figure 4. Violin plot representation of the variation of SBP at admission and at the end of the follow-up. Only patients with baseline and 12-month data for SBP were included in this analysis.



Supplementary Figure 1. Barplot representation of the percentage of active smokers at baseline and that stopped, reduced, or continued to be active smokers at the end of the follow-up. Only patients with baseline and 12-month data for smoking habits were included in this analysis.



Um grande agradecimento ao Professor Dr. Ricardo Carvalho e a Dra. Sílvia Diaz, pela possibilidade de desenvolver este projeto e por toda a disponibilidade e orientação ao longo desta dissertação.

Um agradecimento especial à Dra. Marta Leite pela paciência e pela ajuda incansável e imprescindível na elaboração deste projeto.

Agradeço aos meus amigos e colegas cujo apoio e companhia foram indispensáveis ao longo desta longa caminhada.

Por fim, mas sem ser menos importante, agradeço à Sara, colega e amiga, por toda a ajuda, motivação e calma nos momentos mais atribulados.

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	(a) Page 7 – "Management of cardiovascular risk factors in post-ACS patients: The influence of a structured coronary-disease cardiology consultation (SCCC) program" (b) Page 8 - "Aims: After an acute coronary syndrome (ACS) several therapies have shown to significantly improve the prognosis. However, their implementation in "real world" setting remains suboptimal and few patients achieve the recommended goals. This study aimed to evaluate the impact of a new Structured Coronary-Disease Cardiology Consultation Follow-up Program (SCCC) to optimize the control of CV risk factors in post-ACS patients. Methods: We performed a retrospective analysis comparing two patient cohorts: the SCCC group as the program group versus the Regular Cardiology Consultation (RCC) group as the historical control group. The primary outcome was the control of several CV risk factors such as low-density lipoprotein-cholesterol (LDL-C) levels, glycated hemoglobin (HbA1c) in diabetic patients, systolic blood pressure (SBP), and smoking cessation 12-months after the event. Intragroup analysis was performed using paired Wilcoxon tests. The program impact was assessed via analysis of covariance (ANCOVA) and logistic regression. Results: A total of 521 patients were included in this analysis (237 SCCC vs 284 RCC). Patients included in the SCCC program experienced a significant reduction of LDL-C levels [99.00(IQR:74.00,126.00) mg/dL to

			52.00(IQR:43.00,66.00) mg/dL,p<0.001], HbA1c levels [7.00%(IQR:6.30,7.60) to 6.40%(IQR:6.10,6.85),p<0.001] and SBP levels [134.00(IQR:120.00,145.00) mmHg to 130.00(IQR:117.00,140.00) mmHg,p<0.001], compared to baseline. The ANCOVA analysis demonstrated that the SCCC program had a significant impact in LDL-C levels [β =-13(-19,-6.4),p<0.001], HbA1c [β =-0.49(-0.91,-0.06),p=0.026], and SBP [β =-3.5(-6.3,-0.59), p=0.018] control. No significant impact of the SCCC program was detected on smoking cessation (p>0.9).”
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 10 - “An acute coronary syndrome (ACS) is a challenging manifestation of ischaemic heart disease, which accounts for substantial morbidity and mortality (1-4). Scientific evidence clearly shows that optimization of medical therapy, coupled with lifestyle changes and the judicious use of revascularization procedures, are pivotal to improve patients’ prognosis and quality of life (5, 6). Current guidelines are progressively recommending more ambitious goals for cardiovascular (CV) risk factors (CVRF) control in secondary prevention (7). According to current European Society of Cardiology (ECS) guidelines, a more demanding approach is advocated for cholesterol levels, targeting low-density lipoprotein cholesterol (LDL-C) levels <55 mg/dL (<1.4 mmol/L), with a concurrent LDL-C reduction of >50% from baseline (7). Also, a target glycated haemoglobin (HbA1c) <7% (<53 mmol/mol) or lower in type 2 diabetes mellitus (DM) is suggested (8). As for arterial blood pressure (BP), treatment targets for systolic BP (SBP) range between 120-130 mmHg in <70-year-old patients and <140 mmHg in older patients, while the diastolic BP (DBP) target is <80 mmHg (7).

Although data concurs as to the central role of secondary prevention strategies after an ACS, the proportion of patients who achieve these target levels remains largely suboptimal, leading to continuous and high-level interest in the implementation of strategies to organize the delivery of clinical care to optimize CVRF control and improve outcomes (9, 10).

While cardiac rehabilitation (CR) programs tackle several of these facets, these may fail to achieve recommended levels for CVRF (11, 12). Wittlinger et al reported that patients enrolled in a CR program reached their lowest LDL-C values in the first month after the ACS, revealing difficulty in maintaining the same values during the 12-month follow-up (13). Moreover, CR programs may not be suitable for all individuals, namely because of their timing or because of patients' physical limitations (14). Indeed, Peters et al. demonstrated that only one-third of patients participated in these programs, despite their potential benefits (11, 15, 16).

To address these challenges, some authors recommend the concept of a timely and evidence-based follow-up program for ACS patients, encompassing scheduled follow-up appointments, tailored nutritional and physical exercise recommendations, as well as education on several topics such as weight loss and smoking (5, 17). The French National Health Agency suggests an early and systematic evaluation for post-ACS patients following discharge to address potential adverse reactions that might hinder treatment compliance (18). The 2019 ESC guidelines for the management of chronic coronary syndromes also support this approach, recommending a first patient contact in the first weeks after discharge and suggesting an echocardiographic re-evaluation in the first 8 to 12 weeks (19).

			In this background, we designed and implemented a new structured follow-up program for patients after an ACS, alongside a CR program. This Structured Coronary Artery Disease Cardiology Consultation (SCCC) framework aimed to standardise follow-up after discharge, namely by including early post-discharge re-evaluations, regular and predefined monitoring of CVRF, and collaborating with ancillary areas such as nutrition and smoking cessation (regardless of inclusion in CR). “
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 11 – “In this study we aimed to assess the impact of this SCCC program on the control of several CVRF after 12 months of follow-up.”
Methods			
Study design	4	Present key elements of study design early in the paper	Page 13 – “We conducted a retrospective and comparative analysis between two groups: the SCCC group encompassed patients admitted between August 2021 and July 2022 and followed in the SCCC program for at least 12 months; the Regular Cardiology Consultation (RCC) group, was used as the historical control group and included patients admitted to the hospital from January to December 2018. Unlike the SCCC group, no specific predefined schedules for consultations or CVRF assessment were present in the RCC group, while follow-up was conducted according to the attending physician's judgment. Patients who missed the 12-month follow-up were excluded from the analysis. “
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 12 – “The SCCC program was implemented in August 2021 at the Hospital Vila Nova de Gaia/Espinho and led by a Cardiologist.” Page 13 – “We conducted a retrospective and comparative analysis between two groups: the SCCC group encompassed patients admitted between August

			2021 and July 2022 and followed in the SCCC program for at least 12 months; the Regular Cardiology Consultation (RCC) group, was used as the historical control group and included patients admitted to the hospital from January to December 2018. Unlike the SCCC group, no specific predefined schedules for consultations or CVRF assessment were present in the RCC group, while follow-up was conducted according to the attending physician's judgment. Patients who missed the 12-month follow-up were excluded from the analysis. " Page 13 – "Retrospective data collection from hospital records included baseline characteristics such as concomitant diseases [chronic kidney disease, peripheral artery disease, erectile dysfunction, atrial fibrillation, obstructive sleep apnoea, stroke, cancer, and previous coronary artery disease (CAD)], presence of CVRF (arterial hypertension, dyslipidemia, DM, and smoking habits) at the time of ACS admission, as well as prior medical history. The data regarding patients' previous medical history was collected based on electronic clinical records. Data related to CVRF levels at baseline (ACS admission date) and at the end of the 12-month follow-up (12-months appointment or the one closest to this date) were gathered. CVRF analysed included LDL-C, HbA1c, SBP and smoking habits (self-described)."
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	(a) Page 12 – "The SCCC program was implemented in August 2021 at the Hospital Vila Nova de Gaia/Espinho and led by a Cardiologist. It allowed the inclusion of patients admitted to this hospital for myocardial infarction (MI; with or without ST-segment elevation) or unstable angina, according to the International Classification of Diseases (10th edition) (20). Type 2 MI were excluded given that these can be multifactorial and

not necessarily associated with acute atherothrombotic plaque disruption (21).

Follow-up appointments with a cardiologist were scheduled at least at <2 and 12 months after the ACS. Additional evaluations were performed in those with CV symptoms, left ventricular ejection fraction (LVEF) <50%, uncontrolled CVRF, or according to clinical status [Figure 1]. Over the course of the program, the patient engaged in a multidisciplinary setting, collaborating with highly trained specialists, including physicians, nurses, nutritionists, and rehabilitation physiotherapists. In these appointments, personalized and informative discussions took place, focusing on lifestyle modifications, health education, and underscoring the importance of managing cardiovascular risk factors.

At 2 and 12 months, the program prespecified automatic assessment of blood tests encompassing a complete blood count, ionogram, renal and hepatic profiles, lipid profile, glucose, and HbA1c in patients with DM. A transthoracic echocardiogram (TTE) was performed at 12 months, or earlier in those with a reduced or mildly reduced LVEF at discharge. As for medical appointments, additional analytical and/or echocardiographic assessments could be undertaken according to clinical status.

At 12 months follow-up, asymptomatic patients, with no new events, preserved LVEF (or mildly reduced without changes in follow-up), and on optimized medical therapy were discharged to a general practitioner. Patients not meeting these criteria were discharged to the general cardiology consultation. Though the program was designed for a one-year follow-up, additional assessments up to 18 months after the event were also

			possible, after which patients were discharged (see above).
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	(b) NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 13 – "Retrospective data collection from hospital records included baseline characteristics such as concomitant diseases [chronic kidney disease, peripheral artery disease, erectile dysfunction, atrial fibrillation, obstructive sleep apnoea, stroke, cancer, and previous coronary artery disease (CAD)], presence of CVRF (arterial hypertension, dyslipidemia, DM, and smoking habits) at the time of ACS admission, as well as prior medical history. The data regarding patients' previous medical history was collected based on electronic clinical records. Data related to CVRF levels at baseline (ACS admission date) and at the end of the 12-month follow-up (12-months appointment or the one closest to this date) were gathered. CVRF analysed included LDL-C, HbA1c, SBP and smoking habits (self-described). "
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 13 – "Retrospective data collection from hospital records included baseline characteristics such as concomitant diseases [chronic kidney disease, peripheral artery disease, erectile dysfunction, atrial fibrillation, obstructive sleep apnoea, stroke, cancer, and previous coronary artery disease (CAD)], presence of CVRF (arterial hypertension, dyslipidemia, DM, and smoking habits) at the time of ACS admission, as well as prior medical history. The data regarding patients' previous medical history was collected based on electronic clinical records. Data related to CVRF levels at baseline (ACS admission date) and at the end of the 12-month follow-up (12-months appointment or the one closest to this

			date) were gathered. CVRF analysed included LDL-C, HbA1c, SBP and smoking habits (self-described). ”
Bias	9	Describe any efforts to address potential sources of bias	Page 20 – “Furthermore, the 3-year gap between the follow-up of both groups may introduce bias, considering new treatment options and new recommendations developed during this period. We chose a period before the years 2020 and 2021 to avoid the possible bias associated with the coronavirus disease pandemic (27). Patients with ACS in 2019 were also excluded since their 12-month follow-up period overlaps with the coronavirus pandemic of 2020. “
Study size	10	Explain how the study size was arrived at	NA
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 13 – “Categorical variables were presented as counts and percentages, and continuous variables as median and interquartile range. Patient stratification was performed per intervention, and baseline characteristics were compared using the Chi-Square test, Fisher’s exact test, or Wilcoxon tests, as appropriate.”
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	(a) Page 13 – “Categorical variables were presented as counts and percentages, and continuous variables as median and interquartile range. Patient stratification was performed per intervention, and baseline characteristics were compared using the Chi-Square test, Fisher’s exact test, or Wilcoxon tests, as appropriate. In both groups, LDL-C, HbA1c, and SBP values at baseline were compared to values at the end of the follow-up. Intragroup paired analyses for each study variable were conducted using the paired Wilcoxon test. HbA1c was evaluated only in those with type 2 DM. Patients with smoking habits were categorized based on whether they ceased or reduced smoking at the end of the follow-up.”

		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	(b)NA (c) NA
		(*d*) If applicable, explain how loss to follow-up was addressed	(d) NA
		(*e*) Describe any sensitivity analyses	(e) "The impact of the program on the variation of LDL-C, HbA1c, or SBP levels was assessed through an analysis of covariance (ANCOVA). For this, the statistical model was fitted with each parameter change (calculated as its value after 12 months of follow-up minus its value at baseline) as dependent variables. Baseline values (LDL-C, HbA1c, or SBP), along with age, sex, overweight/obesity, history of CAD, and a variable indicating the group (SCCC or RCC), were included as independent variables. The impact of the SCCC program on smoking cessation, compared to patients who reduced or remained active smokers, was evaluated through a logistic regression. Likewise, a variable indicating the group (SCCC or RCC), age, sex overweight/obesity, and history of CAD were included as independent variables. Statistical analyses and graphical representations were conducted using the R statistical software, version 4.1.2 (22). A $p < 0.05$ was considered statistically significant."
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 15 – "A total of 521 patients were included in this analysis: 237 patients in the SCCC group and 284 patients from the RCC group."
		(b) Give reasons for non-participation at each stage	(b) NA
		(c) Consider use of a flow diagram	(c) NA

Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	(a) Page 27 – "Table 1. Baseline Patient Characteristics." (b) Page 29 – "Supplementary Table 1. Number of missing values for LDL, SBP, and HbA1c at baseline and after 12 months, by group. " (c) NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	Page 26 – "Only patients with baseline and end of follow-up values were included in the intragroup statistical analysis. There were 216 (91.1%) patients in the SCCC group and 138 (48.6%) patients in the RCC group with LDL-C levels measured both at baseline and the end of the follow-up. Among the diabetic patients there were 60 (80.0%) patients in the SCCC group and 41 (44.1%) patients in the RCC with HbA1c levels measured at both time periods. Also, 217 (91.6%) patients in the SCCC group and 280 (98.6%) in the RCC group had SBP values reported both at baseline and the end of the follow-up."
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	(a) Page 15 – "LDL-C levels were significantly reduced in the SCCC group, decreasing from 99.00 (IQR: 74.00, 126.00) mg/dL at baseline to 52.00 (IQR: 43.00, 66.00) mg/dL ($p<0.001$) at the end of the follow-up [Figure 2]. In the RCC group, LDL-C levels were reduced from 100.50 (IQR: 80.00, 142.00) mg/dL, to 66.00 (IQR: 52.00, 83.00) mg/dL ($p<0.001$) [Figure 2]. Page 16 – "In the SCCC group there was a significant reduction in HbA1c values, from 7.00% (IQR: 6.30, 7.60) at baseline to 6.40% (IQR: 6.10, 6.85) ($p<0.001$) at the end of follow-up [Figure 3]. Conversely, in the RCC group no significant reduction in HbA1c levels was observed, from 7.10% (IQR: 6.40, 8.30) to 7.00% (IQR: 6.20, 7.80) ($p=0.09$) [Figure 3]."

			Page 16 – “There was a significant difference from baseline to the end of the follow-up period in the SCCC group in terms of SBP [134.00 (IQR: 120.00, 145.00) mmHg at baseline vs. 130.00 (IQR: 117.00, 140.00) mmHg at the end of the program, p < 0.001] [Figure 4]. In contrast, the RCC group exhibited no significant differences [130.00 (IQR: 114.00, 143.00) mmHg at baseline vs. 130.00 (IQR: 120.00, 141.00) mmHg at the end of the follow-up, p=0.23] [Figure 4].” Page 17 – “Of the 69 active smokers in the SCCC group, 45 (65.2%) quit smoking, 6 (8.7%) reduced the number of smoked cigarettes and 18 (26.1%) continued to be active smokers 12 months after the event [Supplementary Figure 1, Supplementary Table 2]. In the SCCC group, 22 (31.9%) patients participated in smoking cessation appointments. In the RCC group, there were 87 active smokers at baseline. At the end of follow-up, 55 (63.2%) patients quit smoking, 2 (2.3%) reduced the number of smoked cigarettes, and 30 (34.5%) continued to be active smokers [Supplementary Figure 1, Supplementary Table 2]. In this group, about 19 (21.8%) patients participated in smoking cessation programs.”
		(*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	(b) NA (c) NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Page 15 – The analysis of covariance (ANCOVA), adjusted for the covariates defined in the Methods, showed that the new SCCC program had a significant impact on improving the control of LDL-C levels [β= -13 (-19, -6.4), p<0.001] [Table 2]. The baseline LDL-C levels [β= -0.72 (-0.79, -0.64), p<0.001] and history of

			CAD [β = 9.7 (2.3, 17), p=0.010] were also associated with the change of LDL-C levels." Page 16 – "The ANCOVA demonstrated that the SCCC program had a significant impact on HbA1c levels among patients with type 2 DM [β = -0.49 (-0.91, -0.06), p= 0.026] [Table 2]. The baseline HbA1c levels [β = -0.53 (-0.69, -0.36), p<0.001] were also associated with the change in HbA1c." Page 17 – "Once again, the ANCOVA demonstrated that the SCCC program had a significant impact on SBP values change [β = -3.5 (-6.3, -0.59), p=0.018] [Table 2]. The baseline SBP levels [β = -0.53 [-0.60, -0.46], p=<0.001] were also associated with the change in SBP." Page 17 – "There were no significant differences between groups regarding the change in smoking habits at the end of the follow-up period [SCCC group: 45 (65.2%) stopped smoking vs. RCC group: 55 (63.2%) stopped smoking, p=0.14] [Supplementary Figure 1]. According to the logistic regression, the SCCC program had no significant impact on smoking cessation [OR = 1.01 (0.50, 2.04), p > 0.9] [Supplementary Table 3]. Prior history of CAD was associated with lower odds of smoking cessation [OR = 0.24 (0.08, 0.63), p=0.005]."
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page 18 – "In this study we showed that the implementation of a structured program of patient follow-up after an ACS was associated with significant improvements in LDL-C, HbA1c (in those with DM), SBP levels after 12 months of follow-up. These were significantly lower when compared to standard follow-up strategies, and closely aligned with the targets established by the latest guidelines for post-ACS patient

	management. The SCCC program emerged as a multifaceted variant to CR programs, addressing some of their handicaps such as limited patient coverage and elevated drop-out rates (9, 16). Furthermore, the program facilitated attending to the needs of complex patients with multimorbidity, a significant challenge with which several CR programs grapple." Page 18 – "The effect of the SCCC program on LDL-C levels In our study we observed a significant decrease in LDL levels from a median of 99.00 mg/dL to 52.00 mg/dL at the end of the 12 months follow-up. These values were significantly lower compared to other studies in the literature employing structured follow-up programs in secondary prevention. Silva et al reported median LDL-C values of 66 (52-82) mg/dL after an 8-week follow-up (with median post-ACS baseline values of 107 mg/dL), focusing on highly compliant post-ACS patients undergoing a CR program (10). In another study, Anselm K Gitt et al demonstrated that post-ACS patients treated with LDL-lowering drugs reduced their LDL-C levels from a mean of 108.1 mg/dL to 97.2 mg/dL after a follow-up of 4 months (2). While these studies had shorter follow-up periods, they documented better patient compliance immediately after the acute CV event, an effect that diminishes over time (19). In a different study, Wittlinger et al followed post-ACS patients for 12 months, noting a decrease in LDL-C values from 91.4 (±30.8) mg/dL at baseline to 79.3 (±27.2) mg/dL at the end of follow-up (13). We think that the success of the SCCC program in secondary prevention is linked to standardized and frequent measurements of CVRF enabling tailored medication prescriptions. This underscores the impact of a more rigorous and time-effective schedule of

	follow-up consultations and an intensified physician-patient relationship, especially in the first year post-ACS. The protocolized monitoring of cholesterol levels is, in part, responsible for a higher awareness of the patient's lipid profile by the clinicians, allowing prompt pharmacological intervention, as well as compliance assessment and reinforcement. Additionally, it facilitates addressing any reported side effects and enhances patient engagement in their treatment. The program's success is also supported by early referrals to nutrition appointments and the continuous contact with various healthcare professionals (nurses, physicians) which allowed to emphasize and instill the importance of controlling patients LDL-C levels. These factors, combined with the more stringent targets recommended in the latest guidelines, have enabled us to achieve lower LDL-C values." Page 19 – "The effect of the SCCC program on HbA1c Measuring HbA1c in all patients admitted for ACS is an important method of DM screening. However, the real challenge lies in maintaining controlled HbA1c levels, as inadequate blood glucose control is linked to adverse CV events (8). In our study, the SCCC program group achieved median HbA1c levels < 7.0% at the end of follow-up. These values were similar to the ones reported by Silva et al, although they were collected over a longer follow-up period, benefiting less from the phenomenon of increased compliance immediately after the ACS (10). In another study, Denegri et al also observed a reduction of HbA1c values among patients with type 2 DM submitted to a 3-month CR program (from 7.70% to 7.50 %) (23). These results fall short of those observed in our study, enhancing the role of the SCCC in decreasing and maintaining HbA1c levels in the critical distant period after an ACS."

			Page 19 – “The effect of the SCCC program on blood pressure control Although the variation in SBP values was superior in the SCCC group, the higher values at baseline in this group could justify that, at the end of the follow-up, there were no significant differences between the two groups. Nevertheless, the ANCOVA analysis showed that our structured follow-up program for post-ACS patients was associated with a greater reduction of SBP values. Given that arterial hypertension is a prevalent manifestation of atherosclerosis disease, this outcome further strengthens the effectiveness of SCCC program, addressing multiple CVRF simultaneously in a real-world population.” Page 20 – “The effect of the SCCC program on smoking cessation While the SCCC program did not show a significant effect on smoking cessation, our study unveiled a noteworthy success rate of 65.2%, surpassing values observed in other studies (45% smoking cessation following an ACS) (24). The program further reinforces previous findings that factors like a referral to CR programs influence smoking cessation rates.”
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 20 – “Although providing valuable insights, this study has some limitations. Firstly, the relatively small sample sizes and uneven patient distribution between groups should be considered. Secondly, while both groups were similar, there were some differences between them (as depicted in Table 1).The differences in the number of overweight/obese patients and in prior history of CAD could result, at least in part, from increased health literacy in the general population and heightened preventive measures, raising awareness to

			numerous CVRF such as obesity, smoking, dyslipidemia, and arterial hypertension (25, 26). Furthermore, the 3-year gap between the follow-up of both groups may introduce bias, considering new treatment options and new recommendations developed during this period. We chose a period before the years 2020 and 2021 to avoid the possible bias associated with the coronavirus disease pandemic (27). Patients with ACS in 2019 were also excluded since their 12-month follow-up period overlaps with the coronavirus pandemic of 2020. Thirdly, these data pertain to a single centre and as such, generalization of these findings should be cautious. Finally, survival bias should also be acknowledged. Since there were individuals who died or experienced other health complications that led to their absence from the 12-month assessment, our sample may be biased towards "healthier" patients. Albeit this, the missing data, particularly in the RCC group, highlights the impact of the SCCC program in monitoring and collecting data concerning CVRF."
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page 21 "Thirdly, these data pertain to a single centre and as such, generalization of these findings should be cautious."
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 21 – "While these points should be considered, the study provides important real-world data regarding CVRF control in post-ACS patients, which may be of use in optimizing the implementation of secondary prevention strategies in this challenging and very high-risk patient population."
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 21 – "This study was funded by national funds through FCT - Portuguese Foundation for Science and Technology, under the scope of the Cardiovascular R&D Center – UnIC (UIDB/00051/2020 and UIDP/00051/2020)."

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

European Journal of Preventive Cardiology

Instructions to Authors

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European Journal of Preventive Cardiology embraces all the scientific, clinical and public health disciplines that address the causes and prevention of cardiovascular disease, risk factors, as well as cardiovascular rehabilitation, exercise physiology and sport cardiology.

EJPC is the official Journal of the European Association of Preventive Cardiology but it also serves the interests of complementary Councils, working groups in the European Society of Cardiology and other European professional societies, such as hypertension, atherosclerosis, diabetes, internal medicine, behavioural medicine and general practice. It provides an avenue for reports of the European Heart Network, national heart foundations, non-governmental and governmental organizations, and the European Union.

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Term	Recommendations
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Ethnicity	If multi-ethnic populations are studied, the classification should be defined in the methods section and the results given separately in the results section.

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All editorials should be limited to 1,300 words (excluding references), with around 10 references. They do not require an abstract and may include one table and/or figure. In particular, the addition of one figure would be welcome and could add to the understanding and attractiveness of the article. The following different categories of editorials may be considered:

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Research Letters based on original research findings are also allowed, they are not structured, and with no Abstract. The letter may include up to 1000 words, including around 10 references, and one or two figures and/or Tables. While there should be no sub-headings, however, a short description of methods, results and conclusions is required.

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Letters to the Editor may regard comments to an article published in our journal in a previous issue. These letters should have a maximum of 3 authors, should not exceed 700 words and have a maximum of 5 references, including one reference to the article that they are about. We may ask for a reply from the authors of the original article and the letter and its reply will be published together. Letters should present only evidence-based research reports, based on solid scientific research.

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- The title page should carry the full title of the paper, consisting of no more than 20 words (only common abbreviations should be used if absolutely necessary); titles should be clear and brief, conveying the main message of the paper.
- All authors' names: the full first name, middle name/initial (optional) and last name of each author should appear; if the work is to be attributed to a department or institution, its full name and location should be included. Persons listed as authors should be those who substantially contributed to the study's conception, design, and performance as per the guidance in section above.
- The affiliations of all the authors; when authors are affiliated to more than one institution, their names should be connected using a,b,c. These letters should follow the surname but precede the address; they should be used only for the second and subsequent addresses.
- a short running head of 50 characters or less.
- Information about previous presentations of the whole or part of the work presented in the article.
- The sources of any support, for all authors, for the work in the form of grants, equipment, drugs, or any combination of these.
- Disclaimers, if any.
- The name and address of the author responsible for correspondence concerning the manuscript.
- The peer review process as well as publication will be delayed if you do not provide an up to date email address.
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Abstract

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Article citation example:

1. Schroeder S, Baumbach A, Mahrholdt H. The impact of untreated coronary dissections on the acute and long-term outcome after intravascular ultrasound guided PTCA. *Eur Heart J* 2000;21:137-145.

Book citation example:

2. Nichols WW, Rourke MF. Aging, High Blood Pressure and Disease in Human. 3rd ed. London/Melbourne: Lea and Febiger; 1990.

Chapter citation example:

3. Nichols WW, O'Rourke MF. Aging, high blood pressure and disease in humans. In: Arnold E, ed. McDonald's Blood Flow in Arteries: Theoretical, Experimental and Clinical Principles. 3rd ed. London/Melbourne/Auckland: Lea and Febiger; 1990. p398-420.

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4. Panteghini M. Recommendations on use of biochemical markers in acute coronary syndrome: IFCC proposals. eJIFCC 14. http://www.ifcc.org/ejifcc/vol14no2/1402062003014n.htm (28 May 2004)

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Acknowledgments and Funding

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PARECER DA COMISSÃO DE ÉTICA PARA A SAÚDE

TÍTULO DO ESTUDO/PEDIDO

"Estudo retrospetivo de Doença Coronária"

Documento do CES: 138/2022

Serviço onde irá decorrer o Estudo: Serviço de Cardiologia do CHVNG/E

Investigador Principal: Ricardo Fontes de Carvalho

A Comissão de Ética para a Saúde do Centro Hospitalar de Vila Nova de Gaia/Espinho, EPE, em reunião ordinária do dia **15/09/2022,** apreciou a documentação constante do dossier submetido para o estudo acima referenciado:

- Impresso UIEC com resumo do projeto investigação submetido
- Impresso CES
- Requerimento ao Presidente CA
- Aprovação do projeto de investigação pelo Diretor do Serviço de Cardiologia
- Declaração de não existência de conflito de interesses
- Compromisso de comunicação dos resultados obtido
- CV investigador principal/ outros investigadores

Apreciação:

Estudo observacional, coorte retrospetivo, de âmbito académico.

Tem como objetivo caraterizar a amostra de doentes seguidos na consulta de Cardiologia-Doença Coronária. Estudar retrospectivamente a melhoria da qualidade dos cuidados de saúde prestados (o cumprimento dos objetivos terapêuticos de acordo com as recomendações mais atuais e a redução de eventos cardiovasculares) com a implementação da consulta de doença coronária.

Amostragem consecutiva, por conveniência.

Serão selecionados os doentes referenciados para a consulta de Cardiologia-Doença Coronária desde agosto 2021 e os doentes com alta do Serviço de Cardiologia entre agosto de 2018 e agosto de 2019 (pelo menos 12 meses pós SCA em período pré-pandemia Covid 19) com diagnóstico principal de internamento SCA, e com seguimento no Serviço de Cardiologia do CHVNG/E, para efeitos comparativos.

A colheita de dados é feita pelos médicos do Serviço de Cardiologia, incluídos na investigação - outros investigadores, através da consulta dos *softwares* hospitalares (SClinico, *SyngoDynamics*, Cardiobox, Glintt Cardio, Aquarius, RNE, RSE).

Variáveis consideradas: Caraterísticas demográficas/história clínica/fatores de risco cardiovasculares/comorbilidades/medicação habitual/intervenções cardíacas prévias/análises laboratoriais/MCDTs/dados de seguimento (mortalidade, internamentos e complicações; não são contemplados dados sensíveis.

Irá ser construída uma base de dados cujo responsável é o investigador principal, devidamente identificado na equipa de investigação; os dados são pseudoanonimizados; a chave de encriptação ficará na posse do investigador principal e o acesso é limitado e apenas acessível aos investigadores envolvidos na colheita dados que têm autorização para visualização de dados clínicos, utilizando privilégios de acesso (palavra-passe).

Tempo previsto para o decurso da investigação: 2 anos

Garantem confidencialidade e anonimato.

CIEL não aplicável

Os dados serão eliminados após o prazo de 15 anos, até completar o seguimento dos doentes.

Não está prevista a sua transferência para países terceiros ou organizações internacionais.

Está prevista a publicação dos resultados.

Não apresenta custos acrescidos para os doentes/instituição.

Trabalho não financiado.

Cumpre os requisitos éticos.

Ouvido o relator, o processo foi votado pelos membros da Comissão de Ética para a Saúde do Centro Hospitalar de Vila Nova de Gaia/EPE presentes:

Vice-Presidente: Dra Paula Fernandes

Restantes Membros:

Dra. Amelia Pereira

Dra Ana Isabel Paixão

Enfa Teresa Trigo

Delibera-se dar parecer favorável à realização do estudo "*Estudo retrospetivo de Doença Coronária*" o qual foi aprovado por unanimidade dos presentes

Data: 15/09/2022

A Vice-Presidente da Comissão de Ética para a Saúde

Dra. Paula Fernandes