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Original article

Impact of the COVID-19 pandemic on interventional cardiology activity in Spain

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ABSTRACT

Introduction and objectives: The COVID-19 epidemic and the declaration of the state of alarm have led to a decrease in healthcare activity in interventional cardiology units. The objective of this study is to quantify these changes in activity, with special interest in the treatment of patients with ST-segment elevation myocardial infarction (STEMI).
Methods: A telematic survey of 81 centers involved in STEMI networks in the 17 autonomous communities of Spain. Information was collected on diagnostic activity, percutaneous coronary intervention (PCI), structural interventions, and PCI in STEMI on changes in the organization of STEMI networks, and on the prevalence of COVID-19 among interventional cardiologists. Data was compared for the week of February 24 through March 1 (before the outbreak) and for the week of March 16 through March 22 (during the outbreak).
Results: Response has been obtained from 73 centers (90%). A very significant decrease in the number of diagnostic procedures (–56%), PCI (–48%), structural interventions (–81%) and PCI in STEMI (–40%) has been observed. A slight increase in the use of pharmacological thrombolysis has been reported, although primary angioplasty remains the leading reperfusion strategy. Up to 5% of interventional cardiologists (17) had COVID-19.
Conclusions: An important reduction in the activity in interventional cardiology has been observed during the COVID-19 epidemic. Likewise, a great decrease has been detected in the number of patients treated in the STEMI networks, with the risk of increased morbidity and mortality that this represents. Scientific societies and health authorities have to promote that patients presenting STEMI compatible symptoms proceed with no delay to access the health system to receive reperfusion treatment in an appropriate way.

Keywords: STEMI network. COVID-19. Primary angioplasty. Survey. Pandemic.

Impacto de la pandemia de COVID-19 sobre la actividad asistencial en cardiología intervencionista en España

RESUMEN

Introducción y objetivos: La epidemia de COVID-19 y la declaración del estado de alarma han propiciado una disminución en la actividad en la cardiología intervencionista. El objetivo de este estudio es cuantificar esta disminución, con especial interés en el funcionamiento del código infarto.

[◊] *Annex 1 shows the participant centers and researchers in charge of each particular center.*

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Métodos: Se realizó una encuesta telemática a 81 centros de las 17 comunidades autónomas españolas con procedimientos de código infarto. Se recogió información sobre la actividad diagnóstica, el intervencionismo coronario, el intervencionismo estructural y el intervencionismo en el seno del infarto agudo de miocardio con elevación del segmento ST (IAMCEST) sobre cambios en la organización de las redes del infarto y sobre la afección por COVID-19 de las plantillas de cardiología intervencionista. Se compararon 2 periodos: uno entre el 24 de febrero y el 1 de marzo (antes del inicio de la pandemia en Spain) y el otro entre el 16 y el 22 de marzo (durante la pandemia).
Resultados: Se obtuvo respuesta de 73 centros (90%) que evidenció una disminución significativa en el número de procedimientos diagnósticos (–56%), terapéuticos coronarios (–48%), terapéuticos estructurales (–81%) y en el seno del IAMCEST (–40%). Se indicó un leve incremento en el uso de trombolisis. Se diagnosticó infección por COVID-19 en 17 cardiólogos intervencionistas (5%).
Conclusiones: Se observó una reducción importante de la actividad asistencial durante la epidemia de COVID-19 y una gran disminución en el número de pacientes tratados con IAMCEST, con el riesgo de incremento de morbimortalidad que esto supone. Las sociedades científicas y autoridades sanitarias deberían promover que los pacientes con síntomas compatibles con IAMCEST demanden asistencia al sistema sanitario para poder recibir el tratamiento de reperfusión de forma adecuada.

Palabras clave: Código Infarto. COVID-19. Angioplastia primaria. Encuesta. Pandemia.

Abbreviations

ACI-SEC: Interventional Cardiology Association of the Spanish Society of Cardiology. **STEMI:** ST-segment elevation myocardial infarction.

INTRODUCTION

The COVID-19 pandemic caused by the SARS-CoV-2 virus has seriously overloaded the Spanish healthcare system. On March 14, 2020 a national state of emergency was declared in Spain with a special call to house confinement in an attempt to stop the progression of the pandemic.[1] As a consequence, the management of other conditions, among them cardiovascular diseases, has changed. This can be especially significant when it comes to the urgent management of myocardial infarction that, in our country, has been the responsibility of specialized networks for quite some time with primary percutaneous coronary intervention as first-line therapeutic option.[2] The Interventional Cardiology Association of the Spanish Society of Cardiology (ACI-SEC) has taken a proactive approach under the current circumstances with the publication of 2 consensus documents; on the one hand, a document on the invasive approach of ischemic and structural heart disease.[3] On the other hand, another document on the management of catheterization laboratories for the performance of cardiac invasive procedures.[4]

ACI-SEC Working Group on the Infarction Code has developed different actions to promote specialized networks for the management of myocardial infarction and percutaneous coronary intervention as first-line of therapy for patients with ST-segment elevation myocardial infarction (STEMI). One of the main actions taken is the Infarction Code Registry. During 2019 and for 3 months this registry collected data from 5241 consecutive patients in whom the infarction code had been activated in 81 public centers from specific care networks in the 17 Spanish autonomous communities. Using the specific infrastructure of this registry, ACI-SEC has conducted a survey to quantify the degree of damage caused by the COVID-19 pandemic to the catheterization laboratories of our country with special attention to how the infarction code actually works.

METHODS

A remote survey was conducted among 81 centers that participated in the Infarction Code Registry. Almost all centers were part of the specific infarction care networks (only one center did not participate in the survey). The survey was sent back on March 24 and answers were received until March 30; the content of the survey is shown on figure 1.

The primary objective can be divided into 3 main points: *a)* quantify the changes in the volume of patients assisted by the healthcare system: diagnostic procedures, therapeutic coronary interventional procedures, therapeutic procedures for the management of structural heart disease, and therapeutic procedures in the STEMI setting; *b)* assess the changes caused to the activity of the infarction code by the COVID-19 pandemic; and c) assess the impact of COVID-19 on interventional cardiologists health status and activity.

Data on the activity displayed were collected during the week of February 24 through March 1 (prior to the start of the pandemic in our country) and during the week of March 16 through March 22 (during the pandemic). We should mention that during the first week there was a local festivity in Andalusia (February 28) and in Canary Islands (February 25) and during the second week there was another local festivity (March 19) in the autonomous communities of Castile-La Mancha, Region of Murcia, Chartered Community of Navarre, Valencian Community, Basque Country, and Galicia.

RESULTS

Data from 73 centers were received (90% of the total). The nationwide overall data showed a significant reduction in the number of diagnostic procedures (–56%), therapeutic coronary interventional procedures (–48%), structural therapeutic procedures (–81%), and procedures performed in the STEMI setting (–40%). Overall data and data by autonomous communities are shown on table 1, table 2, table 3, table 4, and figure 2. The overall data for Spain is shown on figure 3.

From March 16 through March 22 a total of 40 centers (56%) followed a center specific protocol for the management of patients with COVID-19. On the other hand, in 13 centers (18%) a specific protocol from the infarction code network was followed for the management of patients with COVID-19.

Name of the center (fill in with hospital name):

Changes in the activity of the unit. Register the name of procedures performed each week

	Diagnostic procedures, n	Overall PCI, n	PCI in STEMI, n	TAVI, n	Occlusions (left atrial appendage, ASD, FOP, etc.), n	MitraClip, n
Week February 24 to March 1						
Week March 16 to March 22						

Changes in the Infarction Code Program affecting the center. Fill in box with an "x" Yes/No

	Yes	No
We did not see any major changes		
My center internal protocol on the Infarction Code and COVID-19 has been activated		
A protocol has been activated at AC level with respect to Infarction Code and COVID-19		
More thrombolysis performed since there is no guarantee of proper transfers in a timely manner		
More thrombolysis performed on cases with suspicion/confirmation of COVID-19		
More thrombolysis performed for elective treatments in patients who do not go to an AMI Code-capable center and need to be transferred		
More thrombolysis performed in all cases		
There has been a change in the volume of patients treated, so after pPCI (in my center), patients without complications were transferred to different centers (private, public, etc.)		
There has been a change in the volume of patients treated, so some selected cases that used to be performed in my center are now being transferred to a different hospital (private, public, etc.)		
There has been a change in the volume of patients treated, so the pPCIs that used to be performed in my center are now being transferred to a different Infarction Code-capable hospital (concentration of cases.)		

Medical personnel affected by COVID-19. Register the number of infected doctors in every situation and the overall number of doctors in the unit

	Number of infected doctors	Overall number of doctors in the unit
Some members of the medical team are on sick leave after diagnosis has been confirmed		
Some members of the medical team are on isolation due to close contact		
Some members of the medical team are not in the unit because they are assisting other patients with COVID-19		

Figure 1. Questionnaire filled out by each center. AC, autonomous communities; AMI, acute myocardial infarction; ASD, atrial septal defect; PCI, percutaneous coronary intervention; PFO, patent foramen ovale; pPCI, primary percutaneous coronary intervention; TAVI, transcatheter aortic valve implantation; STEMI, ST-segment elevation myocardial infarction.

We saw a slight change in the indication for reperfusion treatment in 2 centers (in the Community of Madrid and the Basque Country) that indicated a greater use of thrombolysis due to the inability to transfer patients to the infarction code center in a timely manner; 4 centers (2 in the Region of Murcia, 1 in the Community of Madrid, and 1 in Aragon) reported a greater use of thrombolysis in cases of patients with suspicion or confirmation of COVID-19; finally 3 centers (1 in Aragon, 1 in the Community of Madrid, and 1 in the Region of Murcia) reported a greater use of thrombolysis for elective treatment in patients admitted to non-PCI centers and who required transfer to a different center.

Some hospitals reported a change in the management before percutaneous coronary interventions hadbeen detected, in such a way that in 14 centers (1 in the Community of Madrid, 8 in Catalonia, 1 in Castile and León, 3 in Andalusia, and 1 in the Balearic Islands) the patients treated with uncomplicated percutaneous coronary intervention were transferred to other centers for their follow-up; in 4 centers (2 in the Community of Madrid and 2 in Catalonia) some selected cases that used to be treated at the center were treated somewhere else; in 4 centers (1 in the Valencian Community, 1 in the Basque Country and 2 in the Community of Madrid) there was a change in the volume of patients to the extent that all cases of percutaneous coronary intervention that used to be performed at the center were performed somewhere else.

Finally, on the degree of infection of the interventional cardiologists who perform percutaneous coronary interventions, of a total of 339 healthcare workers 17 were infected with COVID-19 (5%), 10 needed isolation because they had been in close contact (3%), and 27 quit interventional cardiology related practices to assist patients with COVID-19 (8%).

DISCUSSION

The results of this study show a significant decrease of interventional cardiology procedures performed after the COVID-19 pandemic was declared in our country. The 40% decrease in interventional procedures performed in the STEMI setting is particularly disturbing. Also, we should mention here the implementation of local or regional protocols to assist these patients in many centers and, last but not least, the significantly high rate of contagion among healthcare workers. We anticipate that with the progression of the pandemic this activity will gradually drop in

Table 1. Variation in the number of diagnostic procedures performed by autonomous community*

Autonomous Community	Weekly diagnostic procedures performed prior to the COVID-19 pandemic	Weekly diagnostic procedures performed during the COVID-19 pandemic	Variation, %
Andalusia	460	254	–45
Aragon	68	31	–54
Principality of Asturias	87	34	–61
Balearic Islands	54	36	–33
Canary Islands	36	37	–23
Cantabria	42	9	–79
Castile-La Mancha	103	47	–54
Castile and León	141	63	–55
Catalonia	410	136	–67
Community of Madrid	327	102	–69
Chartered Community of Navarre	39	15	–62
Region of Murcia	70	48	–31
Valencian Community	342	134	–61
Basque Country	138	52	–62
Extremadura	77	36	–53
Galicia	161	81	–50
La Rioja	22	9	–59
Total	2577	1124	–56

* During the week prior to the COVID-19 pandemic there was a local festivity in the middle of the week in Andalusia (February 28) and Canary Islands (February 25) and during the COVID-19 pandemic week there was a local festivity in the autonomous communities of Galicia, Region of Murcia, Chartered Community of Navarre, Basque Country, and Valencian Community (March 19).

Table 2. Variation in the number of therapeutic coronary interventional procedures by autonomous community*

Autonomous community	Weekly therapeutic coronary interventional procedures before the COVID-19 pandemic	Weekly therapeutic coronary interventional procedures during the COVID-19 pandemic	Variation, %
Andalusia	240	152	–37
Aragon	35	23	–34
Principality of Asturias	36	16	–56
Balearic Islands	27	17	–37
Canary Islands	16	25	56
Cantabria	16	4	–75
Castile-La Mancha	64	18	–72
Castile and León	71	40	–44
Catalonia	209	94	–55
Community of Madrid	143	49	–66
Chartered Community of Navarre	14	6	–57
Region of Murcia	46	21	–54
Valencian Community	165	78	–53
Basque Country	60	38	–37
Extremadura	46	20	–57
Galicia	64	52	–19
La Rioja	10	5	–50
Total	1262	658	–48

* During the week prior to the COVID-19 pandemic there was a local festivity in the middle of the week in Andalusia (February 28) and Canary Islands (February 25) and during the COVID-19 pandemic week there was a local festivity in the autonomous communities of Galicia, Region of Murcia, Chartered Community of Navarre, Basque Country, and Valencian Community (March 19).

several centers and many more healthcare workers will be infected with COVID-19.

Back in 2018 a total of 21261 interventional procedures were performed in our country in the STEMI setting.[2] During the COVID-19 pandemic patients still suffer from STEMI. A recent study on the management of infarctions in Hong Kong, China during the COVID-19 pandemic showed that the time elapsed between the infarction until care was received delayed significantly with median times since symptom onset until the first medical contact of 318 min on average. In the cases managed before the pandemic, median time was only 82 minutes.[5] Our data confirm that added to this additional delay, there is a significant number of patients with STEMI who don't seek medical attention. The reason may be that they are afraid of being infected at the hospitals. This is especially worrying since many patients with STEMI end up with sudden death due to early ventricular fibrillation and never have the chance to be treated.[6] The remaining times until reperfusion—including in-hospital times—were also significantly delayed in the Hong Kong study.[5] We can expect something similar to happen here in Spain.

We are therefore faced with a very unfavorable scenario in patients with STEMI. On the one hand, many will not seek medical attention and, on the other , for those who seek it, time to reperfusion will be longer than usual. In this situation, STEMI driven mortality is expected to grow, due to an increase in sudden out-oh-hospital death and longer ischemia times. Besides, the lack of or the delay in reperfusion will increase the incidence of heart failure, cardiogenic shock, and infarct related mechanical complications.[7] Scientific societies and health authorities need to take strong action to minimize this excess of cardiovascular morbimortality that is expected during the current pandemic. The population needs to be told that seeking medical attention in health centers is safe, that protection against contagion is guaranteed, and that infarction-like symptoms or other serious conditions (strokes, pulmonary embolisms, aorta dissections) require urgent medical attention.

We cannot rule out the possibility that STEMI are being misdiagnosed in patients who go to the hospital seeking medical attention since the healthcare activity displayed these days is focused on the management of patients with COVID-19. Therefore, for staff who are working in the emergency services during this pandemic,

Table 3. Variation in the number of procedures in the STEMI setting by autonomous community*

Autonomous community	Weekly procedures in the STEMI setting before the COVID-19 pandemic	Weekly procedures in the STEMI setting during the COVID-19 pandemic	Variation, %
Andalusia	88	39	–56
Aragon	12	7	–42
Principality of Asturias	16	7	–56
Balearic Islands	8	5	–38
Canary Islands	2	8	300
Cantabria	6	3	–50
Castile-La Mancha	15	5	–67
Castile and León	23	12	–48
Catalonia	74	55	–26
Community of Madrid	55	29	–47
Chartered Community of Navarre	8	4	–50
Region of Murcia	7	9	29
Valencian Community	61	32	–48
Basque Country	13	14	8
Extremadura	13	2	–85
Galicia	28	25	–11
La Rioja	4	4	0
Total	433	260	–40

STEMI, ST-segment elevation myocardial infarction.
* During the week prior to the COVID-19 pandemic there was a local festivity in the middle of the week in Andalusia (February 28) and Canary Islands (February 25) and during the COVID-19 pandemic week there was a local festivity in the autonomous communities of Galicia, Region of Murcia, Chartered Community of Navarre, Basque Country, and Valencian Community (March 19).

Table 4. Variation in the number of structural interventional procedures by autonomous community*

Autonomous community	Weekly structural interventional procedures before the COVID-19 pandemic	Weekly structural interventional procedures during the COVID-19 pandemic	Variation, %
Andalusia	30	10	–67
Aragon	5	1	–80
Principality of Asturias	3	0	–100
Balearic Islands	9	0	–100
Canary Islands	0	2	-
Cantabria	2	0	–100
Castile-La Mancha	6	0	–100
Castile and León	15	5	–67
Catalonia	24	3	–88
Community of Madrid	29	1	–97
Chartered Community of Navarre	0	2	-
Region of Murcia	3	0	–100
Valencian Community	22	3	–86
Basque Country	9	1	–89
Extremadura	2	0	–100
Galicia	13	5	–62
La Rioja	0	0	-
Total	172	33	–81

The procedures included are transcatheter aortic valve implantation, appendage occlusion, closures of interatrial and intraventricular communications, foramen ovale, perivalvular leaks, mitral or tricuspid clip device.
* During the week prior to the COVID-19 pandemic there was a local festivity in the middle of the week in Andalusia (February 28) and Canary Islands (February 25) and during the COVID-19 pandemic week there was a local festivity in the autonomous communities of Galicia, Region of Murcia, Chartered Community of Navarre, Basque Country, and Valencian Community (March 19).

we should emphasise the importance of the correct and early diagnosis of STEMI. The best revascularization option today is still percutaneous coronary intervention that has consistently proven to reduce mortality, reinfarction, stroke, and mechanical complications compared to thrombolysis.[7] The ACI-SEC and the Spanish Society of Cardiology Working Group on Cardiac Catheterization and Interventional Cardiology have both proposed an algorithm where percutaneous coronary intervention should be the treatment of choice. Also, patients with anticipated time delays until mechanical reperfusion should be treated with thrombolysis. Patients with COVID-19 who present at the hospital 3 hours before symptom onset who are hemodynamically stable and have no contraindication for thrombolysis should receive thrombolytic treatment.[3]

Another disturbing piece of information is the reduction in the number of non-emergent diagnostic and interventional procedures not related to STEMI being performed. These procedures will need to be rescheduled after the peak number of patients hospitalized with COVID-19 has been reached. Also, the lack of intensive care unit beds (most filled with patients with COVID-19) can reduce the capacity to perform cardiac surgeries and treat patients with surgical indications. This anticipates more interventional procedures being performed in complex patients who would have required surgical treatment in other circumstances.

Finally, we should mention that up to 5% of interventional cardiologists who participated in the infarction code program have presented COVID-19, in addition to those who remain under confinement or those who are attending COVID-19 patients outside the interventional cardiology units. This scenario is probably applicable to nurses and other healthcare workers at the cathlab. It is essential to protect all healthcare workers with the appropriate personal protection equipment to avoid exposure to COVID-19. Weekly shifts could also be established to reduce the risk of simultaneous contagion of several members of the unit

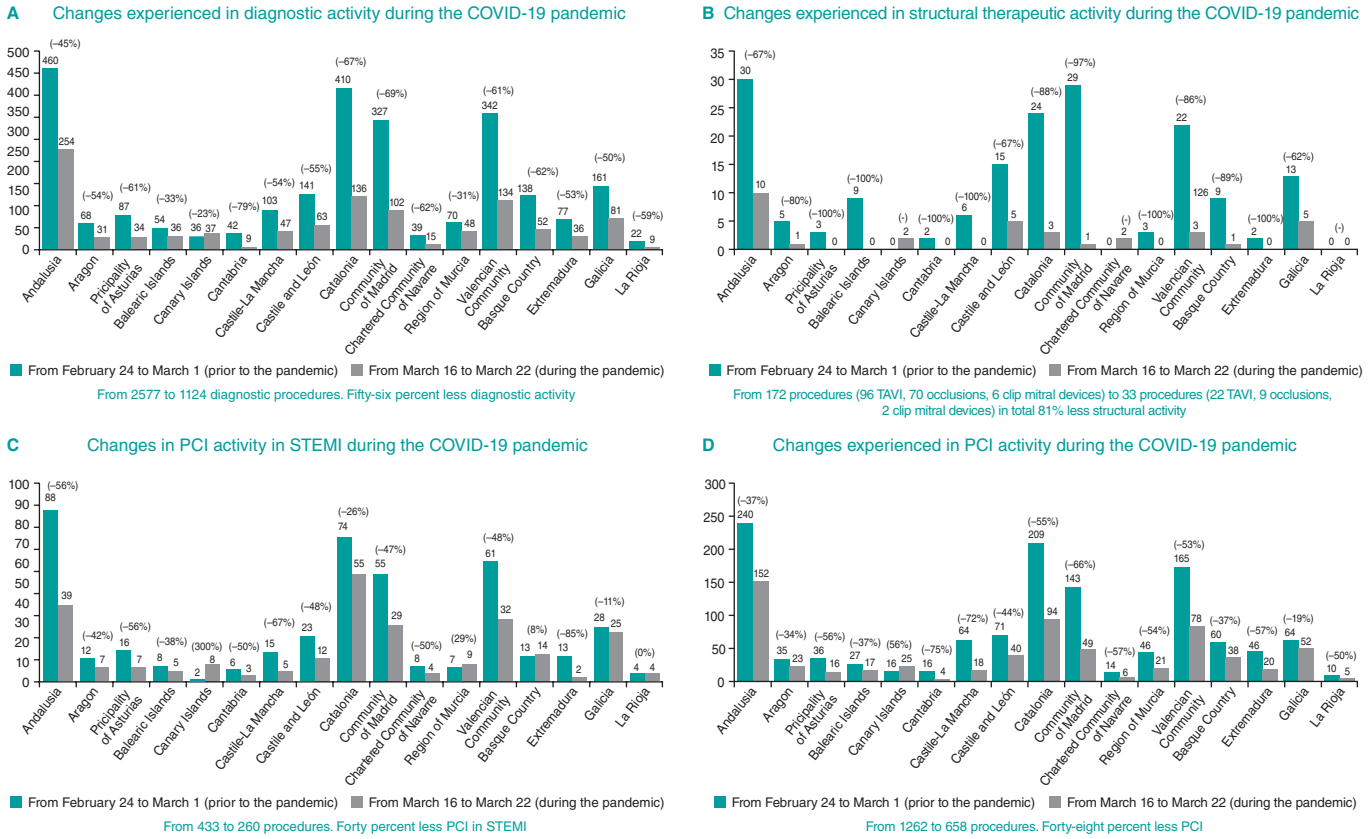

Figure 2. Changes experienced in Spain in different healthcare activities during the current COVID-19 pandemic on an AC basis. **A:** changes experienced in diagnostic activity; **B:** changes experienced in structural therapeutic activity; **C:** changes experienced in PCI activity in the STEMI setting; **D:** changes experienced in PCI activity. AC, autonomous communities; PCI, percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction; TAVI, transcatheter aortic valve implantation.

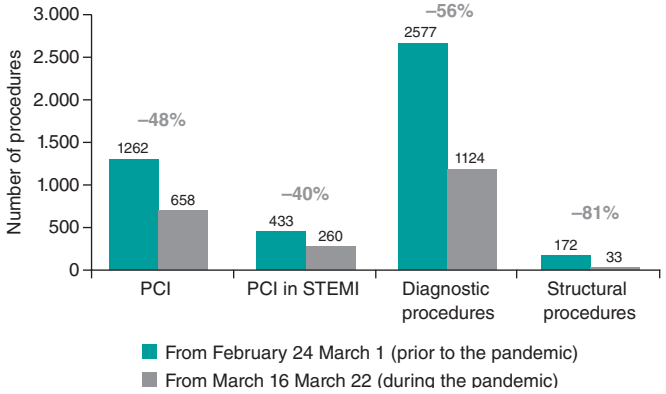

Figure 3. Changes experienced in Spain in different healthcare activities during the current COVID-19 pandemic. STEMI, ST-segment elevation myocardial infarction.

given that these procedures require a very high level of specialization and cannot be performed by other healthcare workers.

Limitations

Although this is a retrospective analysis, the parameters of activity have been well-established in all interventional cardiology units An important limitation is the unavailability of infarction assistance times, patients' clinical characteristics and in-hospital complications. However, as already mentioned, a study has confirmed that reperfusion times are being delayed significantly.[5] Another limitation is that some autonomous communities have had local festivities that may have altered the number of elective procedures performed. Even so, the great reduction of activity seen cannot be attributed to this fact alone since other autonomous communities without any local festivities have also seen their production reduced. Also, STEMI is managed independently regardless of whether there is a local festivity or not. Lastly, there are 8 centers whose activity has not been reported. In Canary Islands there is data for only 50% of centers. Despite the number, the volume of cases reported by those centers is low and only represents less than 5% of all percutaneous coronary interventions performed in the infarction setting.[2]

CONCLUSIONS

This study analyzes the significant reduction of healthcare in interventional cardiology that is being sustained during the current COVID-19 pandemic. Similarly, a great reduction in the number of STEMI patients treated has been observed with the corresponding risk of higher morbimortality. Scientific societies and health authorities need to take strong actionso patients with STEMI-like symptoms can seek medical attention and be properly diagnosed and receive reperfusion treatment.

CONFLICTS OF INTEREST

The authors declared no conflicts of interest whatsoever. R. Moreno is associate editor of *Rev Esp Cardiol.* The journal's

editorial procedure to ensure impartial handling of the manuscript has been followed.

EDITOR'S NOTE

This manuscript has undergone a process of internal review of exceptional priority by the editorial staff due to the special interest of disclosing the information contained herein to the scientific community. The editors wish to thank Permanyer Publications for its collaboration and commitment for the quick publication of this document.

WHAT IS KNOWN ABOUT THE TOPIC?

- Percutaneous coronary intervention is the treatment of choice for patients with STEMI. A recent study conducted in Hong Kong, China during the current COVID-19 pandemic showed it takes longer than usual for patients with infarction to seek medical attention after symptom onset. There is no information available on the number of patients treated during the pandemic compared to the number treated in normal conditions.

WHAT DOES THIS STUDY ADD?

- The COVID-19 pandemic has significantly reducedthe number of STEMI patients treated. Also, a significant reduction of elective coronary and structural procedures has been confirmed. This dramatic reduction in the performance of elective procedures may have an impact on future organization and care. Finally, yet despite how serious the current situation is, infarction code systems are still working adequately.

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Annex 1. Participant centers and researcher in charge in each particular center

Andalusia	
Hospital Universitario Virgen del Rocío	Manuel Villa
Hospital Universitario Virgen Macarena	Rafael Ruiz
Hospital Universitario Regional de Málaga	Carlos Sánchez
Hospital Universitario Virgen de la Victoria	Antonio Jesús Muñoz
Hospital Costa del Sol	Luís Iñigo
Hospital Universitario de Jaén	Juan Herrador
Hospital Universitario Juan Ramón Jiménez	Antonio Gómez
Hospital Universitario Virgen de las Nieves	Eduardo Molina
Hospital Universitario San Cecilio	Juan Caballero
Hospital Universitario Reina Sofía	Soledad Ojeda
Hospital Punta de Europa	Mérida Cárdenas
Hospital Universitario Puerta del Mar	Livia Gheorghe
Hospital Universitario de Jerez de la Frontera	Jesús Oneto
Hospital Universitario Torrecárdenas	Félix Valencia
Aragon	
Hospital Clínico Universitario Lozano Blesa	José Ramón Ruiz
Hospital Universitario Miguel Servet	Juan Sánchez Rubio
Principality of Asturias	
Hospital Universitario Central de Asturias	Pablo Avanzas
Hospital de Cabueñes	Juan Rondan
Balearic Islands	
Hospital Universitari Son Espases	Vicente Peral
Policlínica Nuestra Señora del Rosario	Lucía Vera
Canary Islands	
Hospital Universitario de Canarias	Francisco Bosa
Hospital Universitario Ntra. Sra. de Candelaria	Julio Hernández
Cantabria	
Hospital Universitario Marqués de Valdecilla	José María de la Torre Hernández

(Continued)

Annex 1. Participant centers and researcher in charge in each particular center *(continuation)*

Castile-La Mancha	
Complejo Hospitalario de Toledo	José Moreu
Hospital General de Ciudad Real	Fernando Lozano
Hospital General Universitario de Albacete	Jesús Jiménez
Hospital Universitario de Guadalajara	Enrique Novo
Castile and León	
Hospital de León	Armando Pérez de Prado
Hospital Clínico Universitario de Valladolid	Ignacio Amat
Hospital Universitario de Salamanca	Ignacio Cruz
Catalonia	
Hospital Universitari Bellvitge	Joan Antoni Gómez
Hospital de la Santa Creu i Sant Pau	Joan García Picart
Hospital Universitario Vall d'Hebrón	Bruno García
Hospital Clínic de Barcelona	Salvatore Brugaletta
Hospital Universitari Germans Trias i Pujol	Oriol Rodríguez
Hospital del Mar	Neus Salvatella
Hospital Universitari Joan XXIII	Mohsen Mohandes
Hospital Universitari de Girona Dr. Josep Trueta	Xavier Oliva
Hospital Universitari Arnau de Vilanova	Joan Casanova
Hospital Universitari Mútua de Terrassa	Juan Francisco Muñoz
Community of Madrid	
Hospital Universitario Fundación Jiménez Díaz	Juan Franco
Hospital Clínico San Carlos	Pablo Salinas
Hospital General Universitario Gregorio Marañón	Jaime Elízaga
Hospital Universitario 12 de Octubre	Fernando Sarnago
Hospital Universitario La Paz	Santiago Jiménez
Hospital Universitario de La Princesa	Fernando Rivero
Hospital Universitario Puerta de Hierro Majadahonda	Juan Francisco Oteo
Hospital Ramón y Cajal	Rosana Hernández Antolín
Chartered Community of Navarre	
Complejo Hospitalario de Navarra	Valeriano Ruiz
Region of Murcia	
Hospital Clínico Universitario Virgen de la Arrixaca	Eduardo Pinar
Hospital de Santa Lucía de Cartagena	Luciano Consuegra
Valencian Community	
Hospital General Universitario de Castellón	Ana Planas
Hospital Universitario y Politécnico La Fe	José Luís Díez
Hospital General Universitario	Alberto Berenguer
Hospital Clínico Universitario	Agustín Fernández Cisnal
Hospital Universitario Dr. Peset	Pablo Aguar
Hospital Universitario de la Ribera	Francisco Pomar
Hospital de Manises	Miguel Jerez
Hospitales de Torrevieja-Elche-Vinalopó	Francisco Torres
Hospital General Universitario San Juan de Alicante	Pilar Carrillo
Hospital General Universitario de Alicante	Juan Miguel Ruiz Nodar
Basque Country	
Hospital Donosti	Miren Tellería
Hospital Universitario de Cruces	Koldobika García
Hospital de Basurto	Abel Andrés
Hospital Galdakao-Usansolo	Mario Sadaba
Extremadura	
Complejo Hospitalario Universitario de Badajoz	José Ramón López
Complejo Hospitalario de Cáceres	Javier Fernández Portales
Hospital de Mérida	Juan Carlos Merchán
Galicia	
Complejo Hospitalario Universitario A Coruña	Guillermo Aldama
Complexo Hospitalario Universitario de Vigo	Saleta Fernández
Hospital Universitario Lucus Augusti	Melisa Santás
Hospital Clínico Universitario Santiago de Compostela	Ramiro Trillo
La Rioja	
Hospital San Pedro	Pilar Portero