

# The Mystery of the Missing STEMIs During the COVID-19 Pandemic

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## From Milan to Madrid to Massachusetts, everyone is asking: as the COVID-19 pandemic drags on, where have all the STEMIs gone?

In the Lombardy region of Italy, said Bernhard Reimers, MD (Humanitas Research Hospital, Milan), STEMI cases are down by an estimated 70%. “If symptoms are not too bad, they don't call the ambulance because they are afraid to go into hospital,” Reimers speculated.

In Spain, said Héctor Bueno, MD (Hospital Universitario 12 de Octubre, Madrid), the interventional cardiology working group of the Spanish Society of Cardiology is preparing a paper that shows a drop of 40%. “But I can tell you that's much lower than we're seeing in Madrid,” he told TCTMD. That city has been hit much harder by COVID-19 than the rest of Spain.

“Our situation has become catastrophic and I can tell you that nearly 90% of beds in most hospitals in Madrid are COVID-19 patients, so I think the drop [in STEMIs] in Madrid may be close to 80%. At my hospital, we've seen around three or four patients in the last week while the normal number would be around three patients every day. That's for STEMIs—we haven't seen non-STEMI at all. The situation in Madrid is really difficult. I think people are terrified at home so they're not showing up in the emergency departments, which are totally collapsed.”

The stories are eerily similar around the globe. At George Washington University Hospital in Washington, DC, Jonathan Reiner, MD, estimated they've had just two or three STEMI cases in the last 3 weeks; they usually see three a week, with a yearly volume of 120-150 cases. This has been coupled with a “dramatic decrease” in ACS admissions, he added.

At the Liverpool Heart and Chest Hospital in England, Rod Stables, MD, characterized his hospital as experiencing the “calm before the storm.” Yet during the night spent on call before speaking with TCTMD, he did three cases between 5 and 10 PM, then not a single call all night. “That's unheard of in our place,” he said. Even lower are the hospital-to-hospital urgent referrals for non-STEMI. “We are really feeling the absence of cases there,” he said.

Payam Dehghani, MD, at the Prairie Vascular Research Network in Regina, Canada, says he's part of a WhatsApp group with over 100 interventional cardiologists. “The feeling is definitely significantly less ACS,” he said, adding that he can't yet break that down by STEMI versus NSTEMI.

In Atlanta, Chandan Devireddy, MD (Emory University School of Medicine, Atlanta, GA), estimates they've seen a drop in STEMI volume between 20% to 50%. He cautioned that this is just a 1-month estimate and not “reliable” data. “We really need to see future data from institutions such as the National Cardiovascular Data Registry over the many months that this crisis will likely last to really understand the impacts that the virus itself, subsequent behavioral changes, and social distancing overall made in affecting STEMI care and outcomes,” Devireddy said.

In Boston, Jason Wasfy, MD, described a week spent as the attending cardiologist on the Massachusetts General Hospital cardiac care unit. “I've been a staff cardiologist for 7 years and a trainee for 6 before that, so in 12 or 13 years I've never spent a week in the CCU without seeing

one traditional myocardial infarction,” he told TCTMD. “It could just be a very weird week, but it really raises a concern that patients with cardiovascular complaints or concerns may not be presenting to medical care because they’re afraid of the hospital, they’re afraid of COVID-19.”

## **Speculation Abounds**

There are plenty of theories circulating as to what could possibly drive STEMI rates down during this pandemic. In Madrid and Washington, DC, Bueno and Reiner pointed out that pollution levels are dramatically reduced with so many cars off the road. Having no stressful commutes to work in traffic or on mass transit may also be reducing daily stressors, Reiner added, although he conceded that stress levels are still very high.

Several cardiologists speculated that their patients, trapped at home, are less physically active and are sleeping more. They also may be smoking less, because they’ve heard the lungs are the target of this virus.

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Reimers, for one, dismissed the idea that people are cutting back on cigarettes, given high anxiety levels. “I don’t think staying all day at home that people are really smoking less,” he said. “Psychologically,” with so much uncertainty around this pandemic, “it’s tough to stop smoking.” As for more rest at home, Reimers said: “At first we thought okay, you stay at home, you’re more relaxed, but now staying at home is not so relaxing anymore.”

“There’s no way you can tell me people aren’t stressed,” Wasfy added, echoing a comment made by others. “That’s why I’m concerned.”

As for the possibility that the virus in some way might be protective—this was dismissed out of hand.

“I can’t imagine a plausible biological reason why infection with this virus would somehow quiesce plaques or increase plaque stability,” said Reiner. “There have to be other behavioral issues having to do with people taking their medications, having lower blood pressures, I don’t know,” he continued. “It’s been suggested by some of my colleagues that maybe people are dying at home. But if you look at mortality curves in the United States in the last month, mortality is down. So I don’t understand where the ACS is. It’s very interesting.”

All of the risk factor theories in circulation fall far short of pervasive concerns that patients are ignoring their symptoms out of the fear they will catch COVID-19 if they call an ambulance or end up in the emergency department (ED). In addition to that, said Stables, there may be some degree of “altruism” at play. “Some potential patients might feel that other people have got far worse problems going on at the moment and they may choose not to call emergency services.” And then there’s the possibility that some *are* seeking help, Stables suggested, but given the current strains on healthcare systems, they may not be seen by a cardiologist or referred for the tests and assessments they might ordinarily receive.

## **Blurring the Lines**

Amid the shortfall in expected STEMI cases, there are increasing anecdotal reports of “fake STEMIs” or “STEMI mimics” on social media and in published case series out of China. These are primarily focused on COVID-19 positive patients with troponin elevations or viral myocarditis presenting with acute MI and later found to have no obstructive disease. But even among patients not infected,

physicians may be seeing an uptick in cases of Takotsubo cardiomyopathy and spontaneous coronary dissection, said Timothy Henry, MD (The Christ Hospital, Cincinnati, OH).

“This observation has clearly been made that there’s a drop in true STEMIs and an increase in STEMI mimics, but that’s currently just based on anecdotal information. We have to really document this carefully. If all you see is Twitter, you’d think every case has normal coronaries, and some are saying they don’t need to go to the cath lab. But I know of plenty of patients who have had a standard, regular STEMI,” he said, and those patients still need urgent care.

It’s still the tail end of the regular influenza season, which would typically increase the number of influenza-related STEMIs presenting to hospital, Henry pointed out. “So it doesn’t quite make sense.”

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Henry and Dehghani are the US and Canadian PIs, respectively, for a new North American COVID-19 ST-Segment Elevation Myocardial Infarction Registry (NACMI), jointly launched by the Society for Cardiovascular Angiography and Interventions and the Canadian Association of Interventional Cardiology. Thirty Canadian centers have already signed on, and Henry said he’s hoping for roughly 70 US sites to bring the total to 100. The registry will enroll people who are COVID-19 positive or under investigation for suspected infection who also have ST-segment elevation or new-onset left bundle branch block with a clinical correlate of myocardial ischemia (chest pain, dyspnea, cardiac arrest, or hemodynamic instability). They are then being compared with age- and sex-matched controls from the existing Midwest STEMI Consortium. Institutional review board approval is pending, and a central ECG and angiographic core lab has been established. All going to plan, Henry told TCTMD, the registry hopes to deliver some early results within a matter of weeks.

But there’s another, even more tragic possibility that might explain the mystery of the missing STEMIs. Bueno, in Spain, spoke movingly about the dire conditions at Madrid’s hospitals, the thousands of healthcare professionals falling sick, and the deluge of critically ill COVID-19 patients making it impossible to triage or test for other underlying conditions. He told the story of a COVID-19 patient who mentioned he’d had chest pain 4 days before being admitted to hospital with COVID-19 positive bilateral pneumonia, subsequently developing hemoptysis. An echo and ECG confirmed that he’d had a large anterior myocardial infarction. The patient developed cardiogenic shock and died.

“We’re seeing around 200 to 300 patients per day in each ED of the large hospitals in Madrid,” Bueno said. “So it’s very difficult really to go beyond the avalanche of COVID-19 patients to get a proper clinical history or go into detail. Really all the systems are overwhelmed, but we suspect that probably there’s a number of STEMI patients who are hidden among the avalanche.”

This may be especially true for patients with coronary artery disease, diabetes, and/or obesity who end up being passed over when staff and lifesaving equipment are in short supply and tough decisions are being made about who will get an intensive care bed or who will get a ventilator, Reimers observed. Presence of coronary artery disease is a red flag, he noted, and plays into decisions as to whether or not to intubate. “Patients with coronary disease do not have such a good prognosis to be able to get weaned off the ventilator,” he said.

## **Implications Down the Road**

All of the cardiologists who spoke to TCTMD confessed to mounting unease about what will happen when the pressure of COVID-19 abates and the “hidden” cardiovascular cases come to light.

Reimers said his hospital has seen COVID-19 admissions start to plateau and “some light at the end of the tunnel,” but now they expect to get a clearer picture of what happened to STEMIs that disappeared at the peak of the pandemic. He and his colleagues in Milan are already seeing an uptick in the number of acute MIs presenting very late, and in one case a patient with an interventricular rupture.

This will be the next avalanche, Bueno predicted. “We expect to have a real increase in the number of patients who are suffering the consequences of this crisis,” he said. “I suspect to see mechanical complications, cardiogenic shock, cardiac rupture, and things that we don't see that often now, that probably we will be seeing in the future.” In addition to the number of deaths wrongly attributed to COVID-19, “we will probably see more post-MI angina, reinfarction, and of course heart failure and arrhythmias, as well.”

Stables pointed to the established evidence from randomized trials suggesting that 25-30% of deferred unstable coronary disease patients will be readmitted. “On Tuesday, I did a routine list of urgent cases,” he said. “One of them was a lady who had been admitted to a partner hospital somewhere else in the northwest of England who had actually had an angiogram locally and the angiogram had been sent over and been declared as ‘not too bad’ and that medical therapy was okay. She then had a recurrent infarction and was readmitted.”

He predicts “downstream problems in relatively early-phase recurrent events,” as well as longer term consequences such as rhythm abnormalities and heart failure.

“A bigger burden that I think we need to think about is what's going to happen from the absence of what might be called otherwise elective procedures: outpatient activity is being curtailed, people aren't being assessed, and elective procedures aren't being performed. The death rate from aortic stenosis can be substantial,” for example, he said. “It is conceivable that in the UK the deaths that eventually could be attributed to COVID-19 will be dwarfed by the deaths that have occurred because of the absence of otherwise routine medical care.”

Indeed, Bueno predicted TAVR procedures, for resource reasons alone, won't be coming back any time soon to many programs. The focus at his hospital has switched to saving lives, not to prolonging the life of a 90- to 95-year-old with a TAVR—it's “good medicine, we are happy if we are able to do this,” but priorities changed almost overnight in Milan, he said. This will have a profound psychological impact on physicians and other healthcare workers for years to come.

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Bueno and Reimers both urged hospitals still preparing for the onslaught of COVID-19 patients to think carefully about how to centralize and streamline STEMI care, for a range of reasons. These include making sure a STEMI team remains active and able to accept cases, minimizing crossover infections among patients and healthcare workers, but also freeing up staff to help as needed on intensive care wards.

In the Lombardy region, the number of hospitals offering 24/7 cath lab services has been reduced from 55 to 13 to concentrate acute MIs to a limited number of hospitals. Half of Reimers's cardiology department is now working on COVID wards, he noted. In DC, at Reiner's hospital, the

chief of medicine has polled the entire department of medicine asking who has ICU skills and could be moved as needed.

Wasfy, waiting for a STEMI case in Boston, acknowledged that it must be confusing for patients. “We don’t want people out and about for no good reason, but patients can still contact us if they have symptoms.” Hospitals like his, he noted, are investing heavily in telemedicine to connect with patients who have concerns. “And if they do have symptoms, the emergency departments can still handle clinical issues besides COVID-19. Sure, a screening colonoscopy can be put off for a few months, but chest pain is a symptom that indicates an emergency and we want people to be evaluated,” Wasfy said. “And if they need to come in, they should come in.”

And if, by chance, there are any other reasons why STEMI cases have become so scarce during the COVID-19 pandemic, that needs to be rigorously studied, Reiner said, taking into account all the unfounded theories now circulating about better medication adherence, lower pollution levels, better hypertension control, less smoking, more rest, more time with family, or less physical strain.

“It will be important to figure that out because at some point we're going to get through this,” Reiner said. “We’re going to want to be able to harness what we've learned going forward to keep these numbers down.”